# The Cucuteni-Tripolye Culture

## A Study in Technology and the Origins of Complex Society

Linda Ellis

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This monograph is dedicated to the

100th anniversary

of the discovery of the site of CUCUTENI in 1884.

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# Sources of Illustrations

Abbreviation:

ESSSR Masson, V. M. and Merpert, N. JA. (1982) *Ėneolit SSSR*. Moskva.

Complete references will be found in the bibliography.

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| Fig. 4 | ESSSR |
| Fig. 5 | upper, nos. 1-6: Passek 1935; lower: ESSSR |
| Fig. 7 | Schmidt 1932 |
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| Fig. 75 | Passek 1935 |
| Fig. 76 | upper: Passek 1935; lower: Schmidt 1932 |

# Note on Transliteration/Translation of Placenames

Whenever possible the original spelling of names is preserved. When a particular placename occurs in several different languages due to common international borders (e.g., Danube River, Black Sea, etc.), the English version is used. For names deriving from the Cyrillic alphabet, the IPA system of transliteration is used. One exception is the culture and eponymous site name of "Tripolye" whose spelling has become standard in the English archaeological literature for the past 30 years.

As for Romanian names, a special situation exists, since the Romanian alphabet does contain some unfamiliar letters produced by the cedilla and other accent marks, namely: ţ (=ts), ş (=sh), î/â (=gutteral i), and ǎ (=short 'ur'). Some non-Romanian archaeologists have undertaken, on an inconsistent basis, to transform Romanian names, e.g. Gumelniţa to "Gumelnitsa" or even "Gumelnitza", which is not only erroneous but also causes confusion when reading maps or using the original literature. The National Geographic Society (Washington, D.C.) has maintained original spellings of Romanian placenames and there is no reason why the archaeological literature should not do likewise.

Many Cucuteni-Tripolye sites are located on territories which historically have belonged to Romania and Poland but which subsequently have become part of the USSR following World War II. These Romanian and Polish names were transformed into Russian and Ukrainian, respectively, and simple transliteration alone does not reveal the original spelling which may hinder name recognition in the literature and on maps. The important site of Schipenitz is an exceptional but classic example. Located in the province of Bucovina near the former Romanian-Polish border, it has received five different spellings: Şipeniţi (Romanian), Szypenice (Polish), Šypentsi (Ukrainian), Šipentsy (Russian), and Schipenitz (German). This site was excavated by Oleh Kandyba, and since the report was published by him in German in 1937, the neutral German spelling will be used here. Otherwise, it was deemed most appropriate to give the current Russian or Ukrainian transliteration first and the older Romanian or Polish spelling in parantheses, e.g. Kostešty (Costeşti), Karbuna (Cǎrbuna). Although this is a cumbersome system, it will allow the reader to be able to locate any site or placename in any language, written both before and after World War II.

# CHAPTER I

## Introduction: Technology and Society

The interrelatedness of technology and human society is succinctly summarised in the provocative comment offered by Leslie White:

> ...the social organization of a people is not only dependent upon their technology but is determined to a great extent... by it... . (White 1959:19)

In White's view, the human being has basic needs, i.e. subsistence, shelter, defense, etc., and as such he must harness energy, be it his own or from the environment, and put this energy to work in order to satisfy these needs. Energy is defined simply as "the ability to do work" be it work done internally by the human organism itself or externally by the environment. But the exploitation of energy requires the means and apparatus for so doing--the fundamental principle of technology--and White extends "the use of the term tools to cover all the material means with which energy is harnessed, transformed, and expended" (White 1959:40). White has taken the absolutist position, as exemplified by the introductory quotation, that if the existence of Homo sapiens as a species is dependent upon food, protection from the elements, defense from enemies, and if technology is the means by which these life-sustaining and life-perpetuating processes may be secured, then the social organisation of a people must therefore be dependent upon their technology. And furthermore, "a social system might well be defined as the way in which a society makes use of its particular technology in the various life-sustaining processes" (White 1959:19). Finally, the evolution of social systems has been explained as "when the amount of energy harnessed by man per capita per year is increased; or as the efficiency of the technological means of putting this energy to work is increased; or, as both factors are simultaneously increased (White 1943).

Leslie White was not the only exponent of the role of energy and technology in human development--G. C. MacCurdy had stated that:

> The degree of civilization of any epoch, people, or group of peoples is measured by ability to utilize energy for human advancement or needs. Energy is of two kinds, internal and external or free. Internal energy is that of the human body or machine, and its basis is food. External energy is that outside the human body and its basis is fuel. Man has been able to tap the great storehouse of external energy. Through his internal energy and that acquired from external sources, he has been able to overcome the opposing energy of his natural environment. The differences between these two opposing forces is the gauge of civilization. (MacCurdy 1933:134-135).

However, White was the first to expand on the theme of energy and technology in social evolution and to give us a clear picture of the influence and power that technology wields in human existence.

Although the great revolution in food-getting technology, or agriculture, provided White with his main source of inspiration, it is V. G. Childe's comment on the craft industries which is particularly interesting for anthropological archaeologists who must reconstruct the evolution of social systems using non-biological material finds:

> The ship and the tools employed in its production symbolise a whole economic and social system; the canoe ... also implies an economy, a social organization. ... The bronze axe which replaces (a stone axe) is not only a superior implement, it also presupposes a more complex economic and social structure (Childe 1951:13-14).

Two important concepts derive from this quotation: First, Childe gave the discipline of archaeology the hope that more could be done with excavated materials than merely cataloging inanimate objects into even more lifeless typologies and that there was the possibility of actually being able to say something about the social environment that stimulated the production of these objects. Secondly, Childe forges a link between technological evolution and social evolution--the third, or social, dimension to Christian Thomsen's three-age system which was based solely on technology and time.

Regarding the above theoretical frameworks, at least two major problems are readily visible: Is the influence of technology on society always as one-sided as these hypotheses would have us believe? Secondly, considering that White and Childe were operating under the unilinear schemes of "band-tribe-chiefdom-state" and "stone-bronze-iron", respectively, is the evolution of technology a reliable index of social evolution, or even more fundamental, is the evolution of technology always unilinear?

Concerning the first question, even though White has been criticised for his "technocratic" or "technocentric" view of culture, he himself was quick to point out that:

> Technologies exist and function within social systems and are consequently conditioned by them. A social system may stimulate the technology it embraces, encourage full and free exercise of its functions, and promote its growth and development. Or it may restrict free technological exercise and expression and impose curbs upon its growth. (White 1959: 27)

M. Sahlins has also issued a warning against correlating increases in the efficiency of technological operations with progressive cultural development:

> Technological innovation can raise efficiency, i.e., increase the amount of energy captured per unit of human energy expended, yet still not stimulate the progressive development of a culture. Whether or not, or to what extent, a gain in productive

> efficiency is actually employed in the build-up and maintenance of higher organization depends on local selective circumstances. An increase in efficiency may not be directed toward any advance whatsoever if the existing adaptation cannot accommodate it or the selective pressures remain insufficient to induce it. A people may adopt a technological innovation that theoretically might double output, but instead, they only work half as long (twice as efficiently) as they used to. (Sahlins 1960)

Rather than measuring specific instances of technological progress and any effect they might have on a society, Sahlins, in his attempts at generalising, prefers that the idea of progress "is the total transformation of energy involved in the creation and perpetuation of a cultural organization." He suggests a usable method of quantifying the thermodynamic achievements of different cultures by calculating population size multiplied by average manpower, in energy units, over one year plus any non-human mechanical energy. Although admittedly there is a lack of ready estimations of cultural progress in energy terms, and at the moment it appears difficult to quantify cultural evolution, a qualitative solution is suggested by Sahlins:

> As in life, thermodynamic achievement has its organizational counterpart, higher levels of integration. Cultures that transform more energy have more parts and sybsystems, more specialization of parts, and more effective means of integration of the whole. Organizational symptoms of general progress include the proliferation of material elements, geometric increase in the division of labor, multiplication of social groups and subgroups, and the emergence of special means of integration: ... such as chieftainship and the state ... . (Sahlins 1960)

Concerning the second question posed above, while the grand trio of energy-technology-society has received recognition for quite some time, the exact nature of technological evolution has not been dissected at all in the archaeological literature, nor has the reliability of technological data been assessed as an index of social evolution.

V. G. Childe, among many other, experienced endless difficulties in attempting to fit unilinear techno-economic schemes to the archaeological data (Childe 1944). And when Christian Thomsen's technological three-age system was subdivided, the resulting typology was valid only for a restricted archaeological region. It was difficult to acknowledge that Thomsen's technological ages were entirely arbitrary and therefore Childe rejected the word "phase" and continued to subdivide the metal ages into "modes" which would classify societies not only on the basis of chronology but also on how various metals and alloys were being utilised, i.e. for ornamention, weapons, or tools in agriculture, etc. (Childe 1944).

The major problem here lies in the prehistorian's concept of technology as a unilinear phenomenon, and a subsequent state of confusion arises when this particular scheme does not fit the archaeological data from other regions. The stone-bronze-iron progression is a misleading concept in the study of both cultural and technological development. Iron and bronze/copper pyrotechnologies do not just simply derive out of each other, nor out of stone-working. Subtractive technology is very different to pyrotechnology and ferrous metallurgy is not a simple derivation from non-ferrous metallurgy--these technologies deserve to be treated as multilinear phenomena or at least as having multiple technological origins. Technology is a cultural, ecological, and economic study unto itself--it should not be used as an element of time but an entity to be studied through time in conjunction with other sociocultural data.

If linking fundamentally different technologies in a single line progression which was then used as a dating method has brought problems, the lack of correlation between technological evolution and social evolution has caused much unnecessary bewilderment among prehistorians. Unfortunately, Leslie White's comment 25 years ago has been overlooked:

> If social institutions are shaped by the operation of technologies, then social change will tend to follow technological change. But the institutional response to technological change may not be immediate. Institutions come to have an inertia of their own. ... Thus a dislocation between institution and technology may arise; the lag between institutional change and cultural change is notorious. (White 1959:21)

It has been accepted generally that social evolution (i.e. band-tribe-chiefdom-state) parallels technological evolution (i.e. stone-bronze-iron). But it has also been discovered that anomalies of supposedly precocious technology do exist within the context of less developed communities. There are two reasons why this lack of correlation has arisen: First, as stated earlier, technology has been treated as "time" and not as technology. Secondly, when new techniques of processing natural materials are introduced into the craft repertoire, inventions foster even more ideas and technological development appears to make a logarithmic curve; whereas society is usually slow to accept new ideas. In this context, C. Renfrew (1978a) has published a very useful distinction between "invention" or discovery and "innovation" or acceptance of that discovery by society, wherein may lie some unknown but definite time factor. And using what White has stated, an additional time factor may be due to the fact that society may encourage or may restrict full technological expression (White 1959:27).

If developments in technology will ultimately have considerable influence on the organisation of human societies, then research on this phenomenon would be most fruitfully directed on societies undergoing a period of technological transition. It would be during such a transition period, when we could follow new technological innovations as they occur and at the same time be aware of any changes or modifications in social organisation. One of the most intriguing and least understood of the major social transitions which have occurred in human history is that of the initial formation of ranked society and the factors which brought it about.

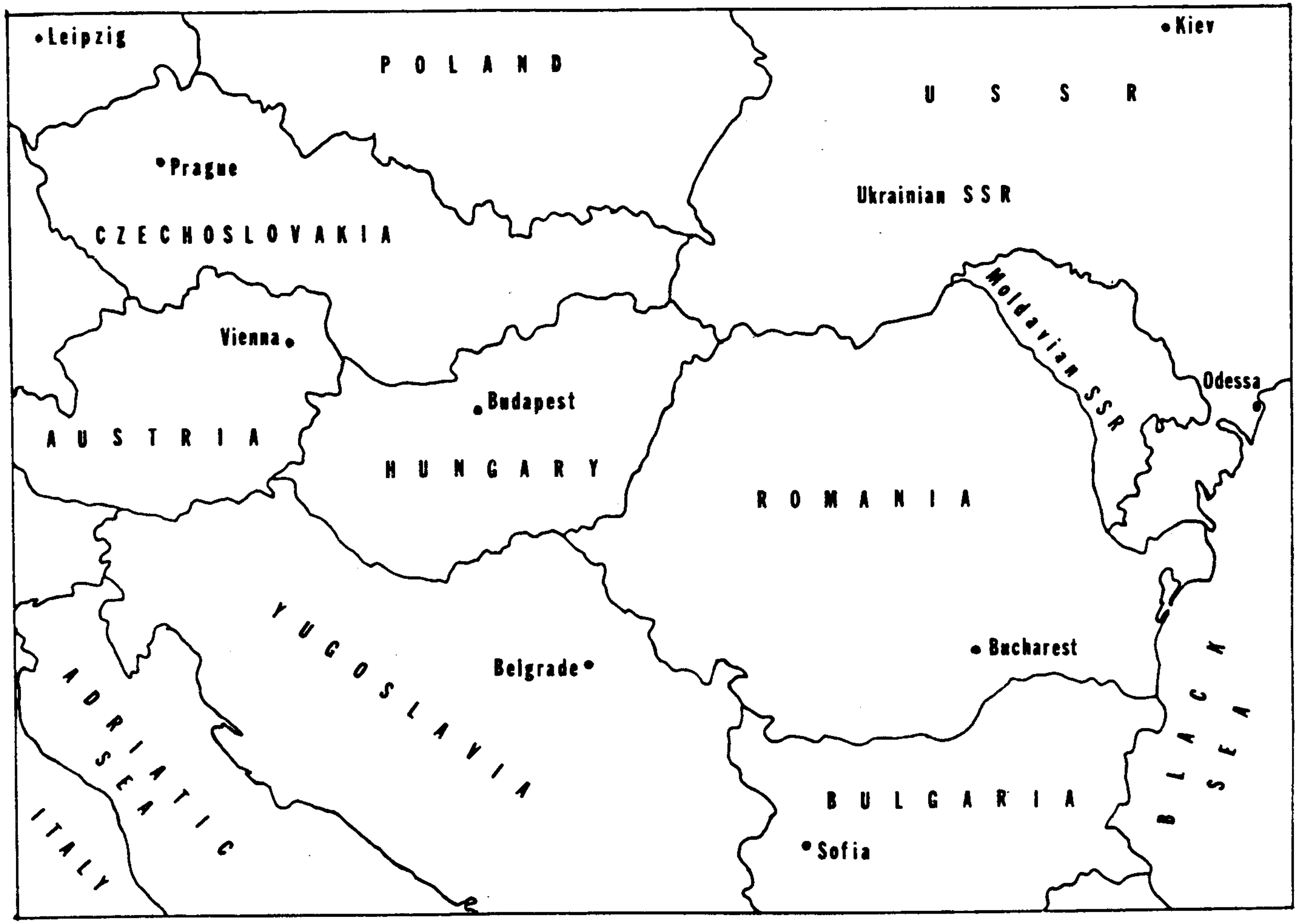
In order to study a transition in technology and the subsequent social changes which, if they do occur, would be considerably delayed (as suggested by Leslie White), a substantial time depth is needed--the kind of time depth offered by the archaeological record. But without living informants, would we be able to detect transformations in, for instance, the pyrotechnological industries in terms of energy input (i.e. resource exploitation, fuel consumption, labour allocation and diversification) and product output (i.e. product standardisation, mass production methods); and what are the consequences for craft specialisation, the number of individuals involved in technological operations, their respective tasks, and the eventual establishment of centres for product manufacturing? But more importantly, would we be able to detect the acceleration of manufacturing and its effect in the larger sphere of socio-economic development and the creation of ranked society?

Within this context, a time, a place, and a people have been found that can help us clarify many of the above-listed questions: The Cucuteni-Tripolye culture is offered here as an example for the understanding of advancements in technology and socio-economic organisation during a period when we can document the very beginnings of a "chiefdom" or ranked society. This culture and the particular circumstances surrounding it are not guidelines by which other societies in all time periods may be judged, but the Cucuteni-Tripolye culture does offer very useful data on a transformation in human social evolution and the role technological development assumes in bringing forth an early form of ranked social organisation.

This culture occupied the territory of present-day eastern Romania, the Moldavian SSR, and the Ukrainian SSR (map 1) and dates to approximately 4500-3000 B.C., calibrated, or 3800-2300 b.c., uncalibrated dating (cf. chapter II). The Cucuteni-Tripolye culture evolves somewhat before and during one of the major technological transition periods: between the Neolithic and the Bronze Age. It was during this period on the Balkan Peninsula that copper and its carbonate ores were being processed for the production of utilitarian objects for the first time in this region; but copper never replaced stone tools, hence the use of the term "Chalcolithic" or copper-stone age.

Not only the processing of metals, but ceramic production--the pyrotechnological foundation of metallurgy--was also undergoing transformation at this time. The classical trichrome (red-black-white) ware of the Cucuteni-Tripolye culture indicates technological advancement and competence competitive with any other pre-Bronze Age society in the Old World. The technological skill is made manifest in every step of the manufacturing process: The high degree of clay refinement, the manipulation of clays without the assistance of temper, the development of an early form of the potter's wheel, the choice of raw materials for specific colours under carefully controlled atmospheric conditions, the use of high firing temperatures that reached 1000°C, the construction of elaborate up-draught kilns, as well as the attainment of a completely reducing atmosphere (in the western province of this culture) and a completely oxidising atmosphere (cf. chapter III for discussion and references).

One of the intriguing aspects of the technology is the occurrence of the aforementioned kilns which are found in all phases of this culture. Thirteen sites are known to have had up-draught kilns--their first occurrence in temperate Europe--and many more sites have simpler versions of kilns. At some settlements remains of up to 18 contemporaneous kilns are found (cf. chapter III). Also noteworthy are the



Map 1 Political boundaries: Central-Eastern Europe and the Northern Balkans

two-storey structures which have been discovered; some serve as dwellings, but others turn out to be ceramic workshops on the lower level, with an upper loft for drying pottery (cf. chapter III).

All of the foregoing evidence--together with suggested revisions in the classification of ceramic styles, which possibly suggest products from regional workshops (cf. chapter II)--indicate that the manufacturing of ceramics had evolved into an organised, labour-efficient industry and that we can identify in the archaeological record settlements which have become ceramic production centres.

Concerning socio-economic evolution during the Chalcolithic, the archaeological data on settlement patterns and population growth for the Cucuteni-Tripolye culture is very rich but, unfortunately, has yet to be confronted by thorough excavation and analysis. The typical Cucuteni-Tripolye village consisted of 20-50 dwellings and was located on naturally protected areas and in addition had man-made ditch/rampart fortification. However, this fairly consistent pattern is disturbed by six, and possibly more, highly unusual settlements that date only during the latest phase of this culture. These settlements consist of 150, 200, 500 to over 1500 buildings, and settlement size ranges up to 400 ha, as revealed by geophysical and aerial reconaissance. These great numbers of structures are arranged into tightly concentric rings or ellipses, indicating contemporaneity and preconceived planning (cf. chapter IV for discussion and references).

Clearly, a fundamental socio-economic change has manifest itself in these large, agglomerated settlements. This is of course a slow, evolutionary process beginning at about 4500 B.C. (3800 b.c.) and terminating at about 3000 B.C. (2300 b.c.). This reorganisation of Cucuteni-Tripolye society and settlements undoubtedly has multiple causes, not the least important of which is the rise of various industries and production centres. Already at early sites for this culture, we find major ceramic manufacturing centres, while the settlements were still under 50 dwellings. These early manufacturing centres had begun a trend in the production of fine-grained and dense, high quality ceramics which were fired in a high temperature and well oxidising atmosphere. Moreover, the trends in vessel form and size as well as the archaeological context of these vessels indicate that Cucuteni-Tripolye painted ceramics played a major role in the food storage capability of this prehistoric population. Thus innovations in pyrotechnology and the adoption of mass production methods (such as the use of rotary motion, reduction of surface decoration, and the use of up-draught kilns) allowed a more stable food supply and therefore assisted the maintenance of a higher population density and at the same time required a social hierarchy for the organisation of technological operations and the distribution of the finished products (cf. chapter IV for discussion).

The quality of the ceramic production also surpassed all contemporary materials in temperate Europe, thus yielding a technological surprise in the archaeological record. However, as stated earlier, if we allow for the conservativeness of social institutions, if we consider the very early manifestation of regional artistic and technological centres, and if we document a developing control over the manufacturing methods and the recognition of the benefits, and subsequent exploitation of, technological innovations, then the agglomerated settlements occurring a thousand years later should also be no surprise. What we see here are the natural evolutionary progressions of technology and society, as predicted by L. White, each with its unique course and rate of growth.

# CHAPTER II

# Origin and Development of the Late Neolithic-Chalcolithic Cultures Northwest of the Black Sea

## II.A. Introduction

The discovery of the site of Cucuteni in northern Moldavia 100 years ago can be said to be the effective starting point of research on the subsequently named "Cucuteni culture" in Romania (1). Several researchers have conducted campaigns during the past 100 years at Cucuteni, the two most notable of which are the German archaeologist Hubert Schmidt who began systematic excavations in 1909 and who published his data and established the relative chronology in his monograph of 1932, and most recently the Romanian archaeologist M. Petrescu-Dîmboviţa who had opened unexcavated areas of the site in the 1960s. The recognition of an archaeological assemblage antecedent to and connected with the genesis of the Cucuteni culture, and named the "Pre-Cucuteni culture", was first clearly described by Radu Vulpe in 1937 from his excavations at Izvoare. The site of Tripolye, near Kiev, was first excavated by V. Khvojko in 1899, and ever since the Russian and Ukrainian scholars have been working on this same ("Tripolye") culture whose relative chronology was established and refined by T. Passek in 1935 and 1949.

This chapter will provide the chronological and cultural background necessary in order to elaborate on other issues in future chapters. Since so many typological problems exist, and with so many implications for the analysis of pyrotechnology, it was thought best to present the ceramic typology here in simplest form for the purposes of discussing relative chronology and to analyse the typological systems in more detail in footnotes appended to this chapter.

## II.B. The Pre-Cucuteni period

The settlement area during the Pre-Cucuteni period included southeastern Transilvania, Moldova, and part of the Dnestr and Southern Bug River valleys during the Late Neolithic (maps 2-4; fig. 1).

This period has been subdivided into three phases, designated as Pre-Cucuteni I, Pre-Cucuteni II, and Pre-Cucuteni III. The latter phase has been termed "Tripolye A" in the Ukrainian chronology, since this is the only phase of this early period that has been found in the USSR. These subdivisions are based primarily on observations of the ceramic inventory through time. During all three phases, three types of ware, ranging from a finely decorated to a coarse utilitarian ware, have been identified. The forms of Pre-Cucuteni ceramics include cups, vases with tall cylindrical necks, biconical vases and cups, bowls with flaring or everted rims, pedestalled vases, lids, ladels, and strainers

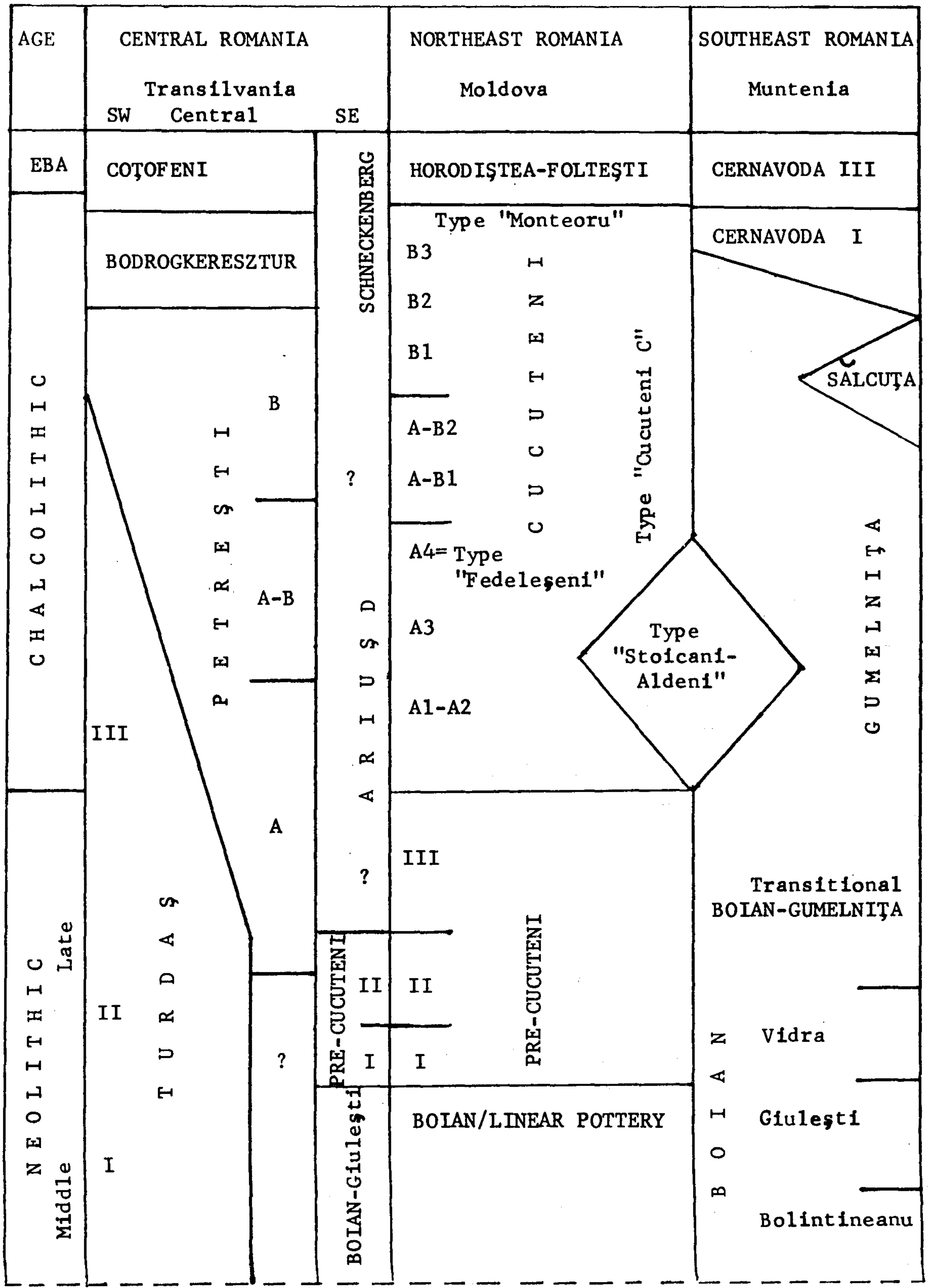


Fig. 1 Relative chronology of Late Neolithic and Chalcolithic cultures of central, northeastern, and southeastern Romania.

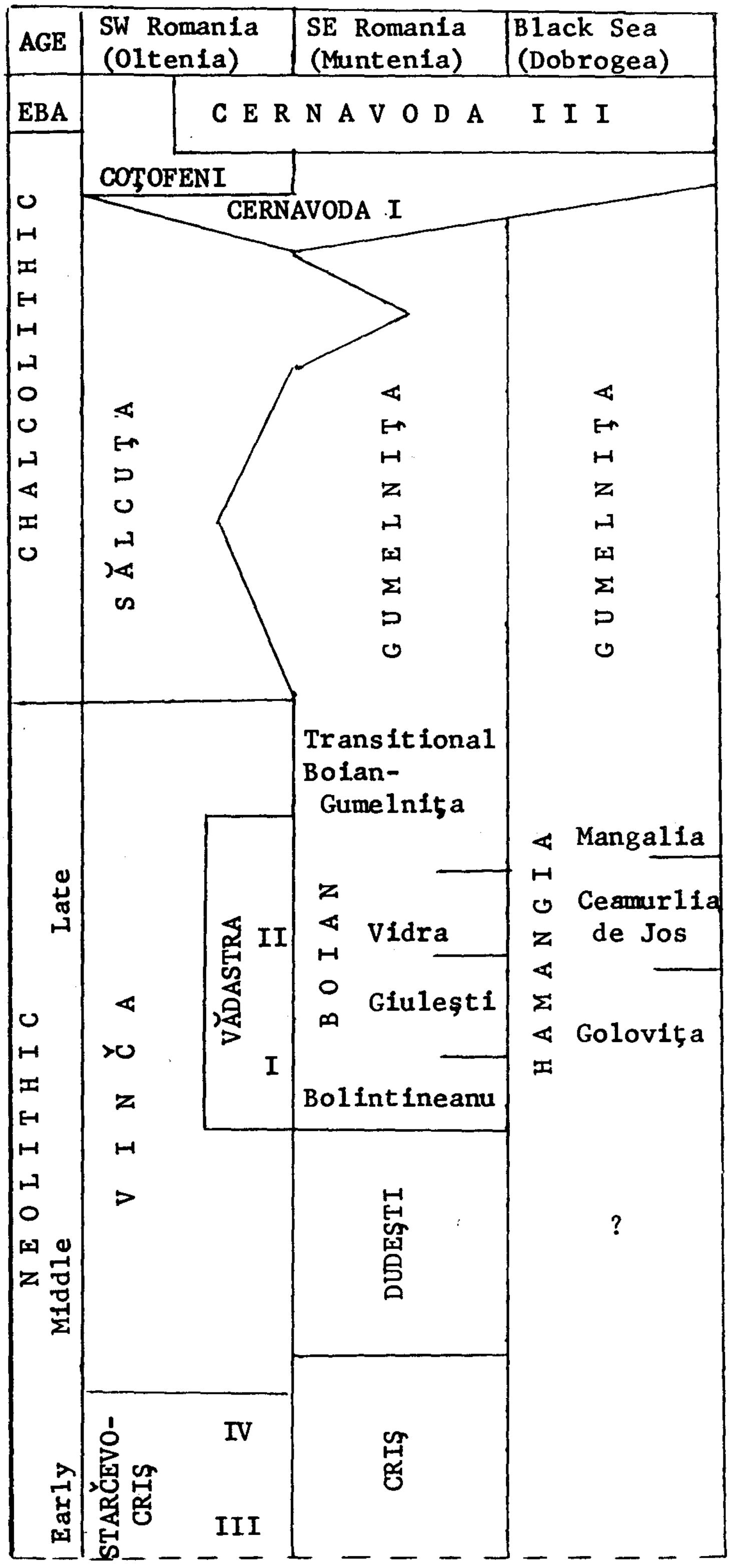
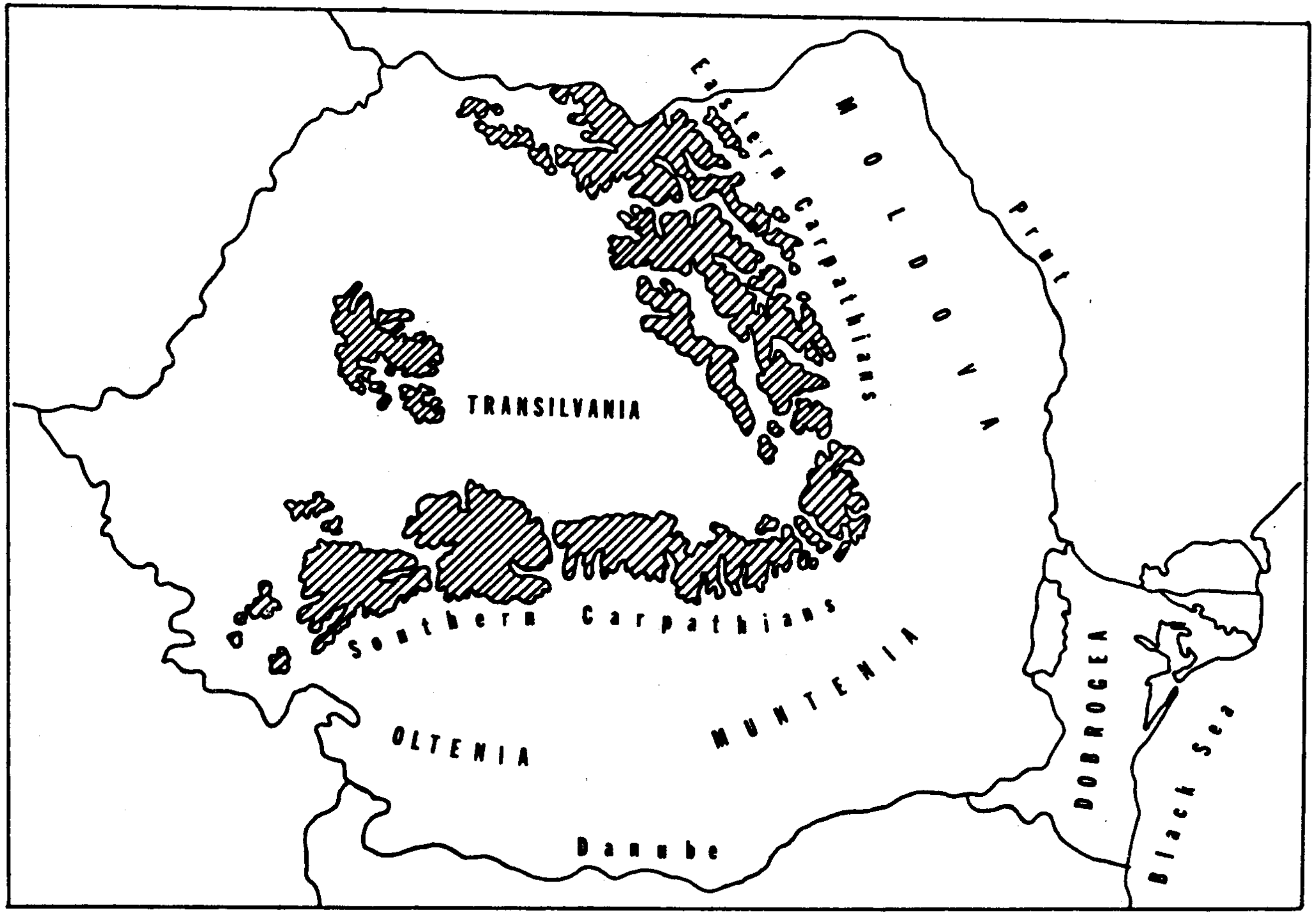


Fig. 2 Relative chronology of Late Neolithic and Chalcolithic cultures of southwestern, southeastern, and coastal Romania.



Map 2 Historical Provinces and Mountain Ranges in Romania

(colanders). During Pre-Cucuteni II, pyriform vases with tall necks and pedestalled bowls appear (fig. 3).

Surface decoration during the first phase includes channeling (i.e., smooth, shallow furrows)--placed horizontally or sometimes obliquely--in combination with incising. Incised motifs consist of pairs of parallel horizontal lines in between which are either a series of vertical lines (resembling a "ladder") or a series of notches or fine points. Excising, which leaves the intended design in relief, is prevalent also, and common motifs include series of triangles ("wolf's teeth"), alternating excised squares with squares in relief ("chessboard"), rhomboids, and excised or reserved bands in angular or spiralic designs.

During Pre-Cucuteni II, there is a predilection for spiralic and geometric designs in more complicated and varied patterns, and channeling is not only placed horizontally, but also obliquely and in circular fashion. The pairs of parallel horizontal lines filled with vertical lines, notches or points during Pre-Cucuteni I are transformed into linear series of tiny rectangular impressions made by a very fine tool, probably of bone; these impressions at first form a simple row and develop into multiple rows of spiralic and angular designs and sometimes pairs of rows are connected by vertical incised lines forming "ladders".

The excised decoration disappears during the last phase of Pre-Cucuteni. Channeling is preserved in an oblique, circular or horizontal manner, as well as series of channels in concentric circles placed around projections from the surface of the vessel (fig. 5). The aforementioned series of rectangular impressions continue. Incising is used in a growing complexity of spiralic patterns; among incised motifs are circles with tangents to those circles, and Pre-Cucuteni III ceramics had a predilection for reserved motifs formed by incising--a technique exploited by the succeeding Cucuteni-Tripolye periods and subsequently rendered in painting (Marinescu-Bîlcu 1974).

Only five sites have been identified as belonging to the first phase and are located between the Olt and Siret Rivers (map 3). Pre-Cucuteni I was defined on the basis of finds from a single site, Traian-Dealul Viei, by H. Dumitrescu and consequently was assumed to have existed on a larger, regional basis. In addition, the materials at Traian-Dealul Viei were even thought erroneously to have formed a separate culture, called "Zăneşti"--a term which still lingers in the literature as a synonym for Pre-Cucuteni I (Comşa 1974b). The subsequent Pre-Cucuteni II and Pre-Cucuteni III phases were defined on the basis of finds from the sites of Larga Jijia and Izvoare, respectively; but on a regional basis these phases rest on firmer archaeological foundations than Pre-Cucuteni I (Vulpe 1957). Moreover, as excavations at Tell Poduri have shown, these latter two phases of Pre-Cucuteni were relatively lengthy in duration and even merit subdivision, creating additionally a Late Pre-Cucuteni II, Classical Pre-Cucuteni III, and Late Pre-Cucuteni III (Monah, et al. 1983).

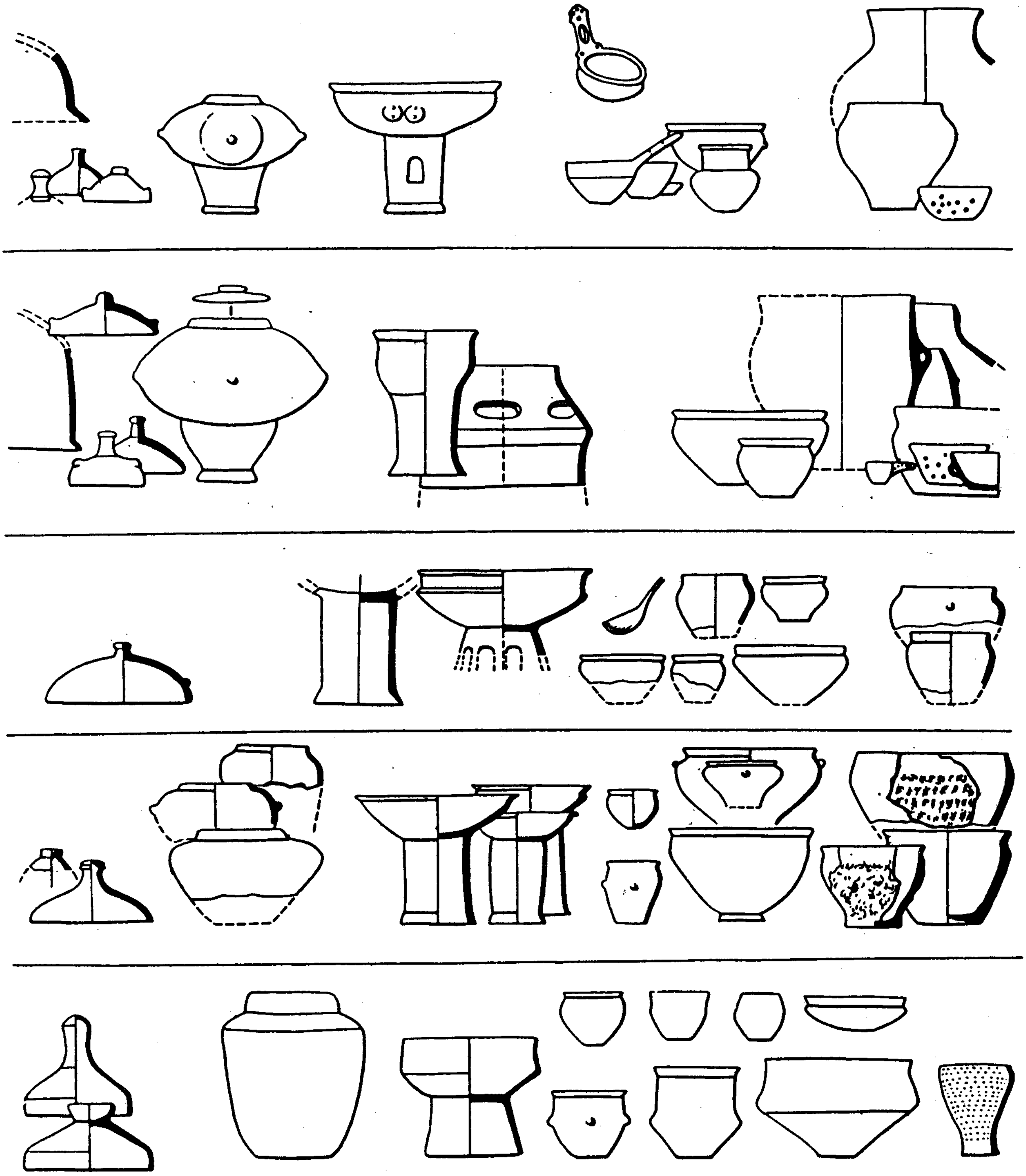


Fig. 3 Pre-Cucuteni (all phases) and Tripolye A vessel shapes from Romania and the USSR.

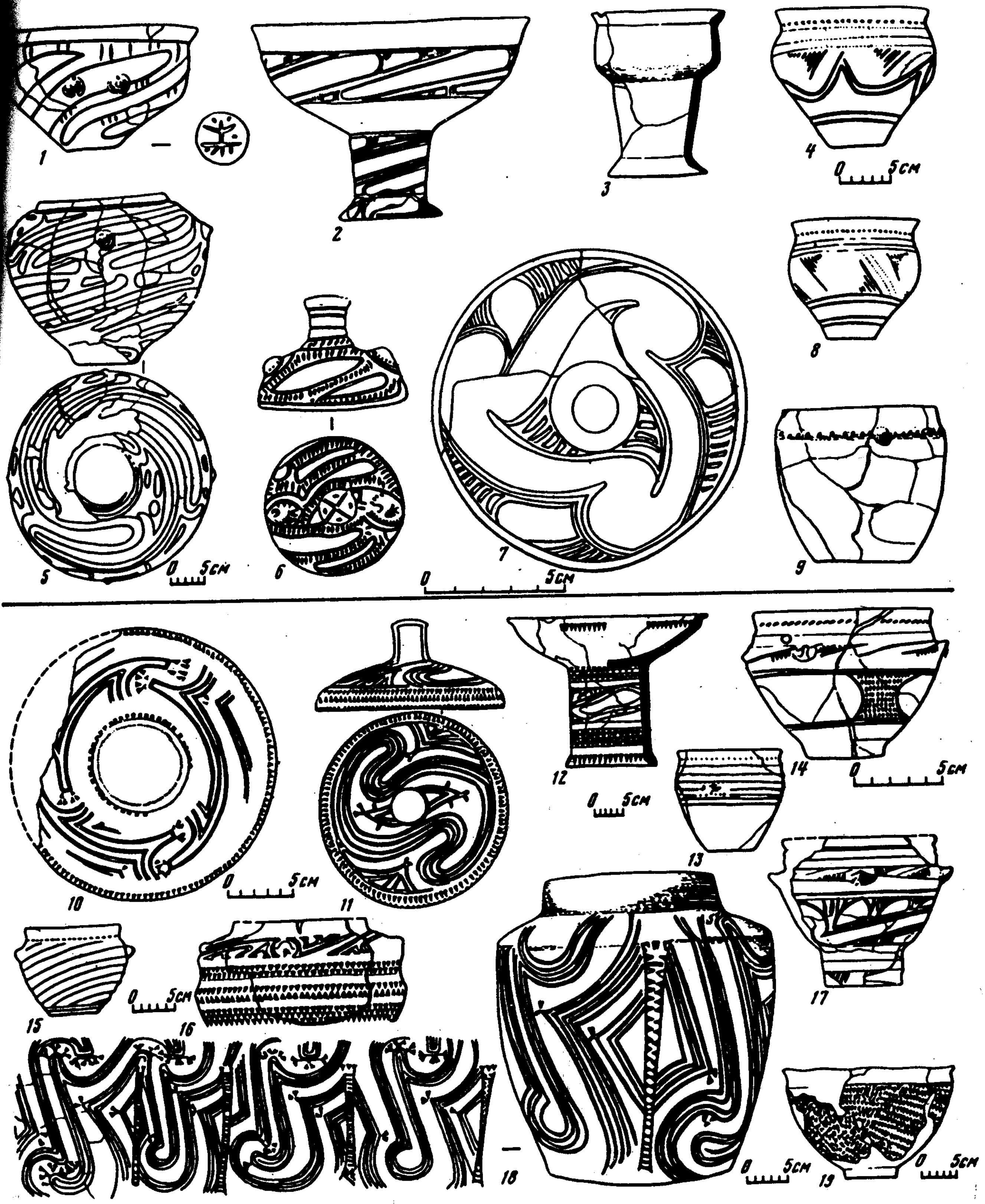


Fig. 4 Pre-Cucuteni (all phases) and Tripolye A vessel decoration from Romania and the USSR.

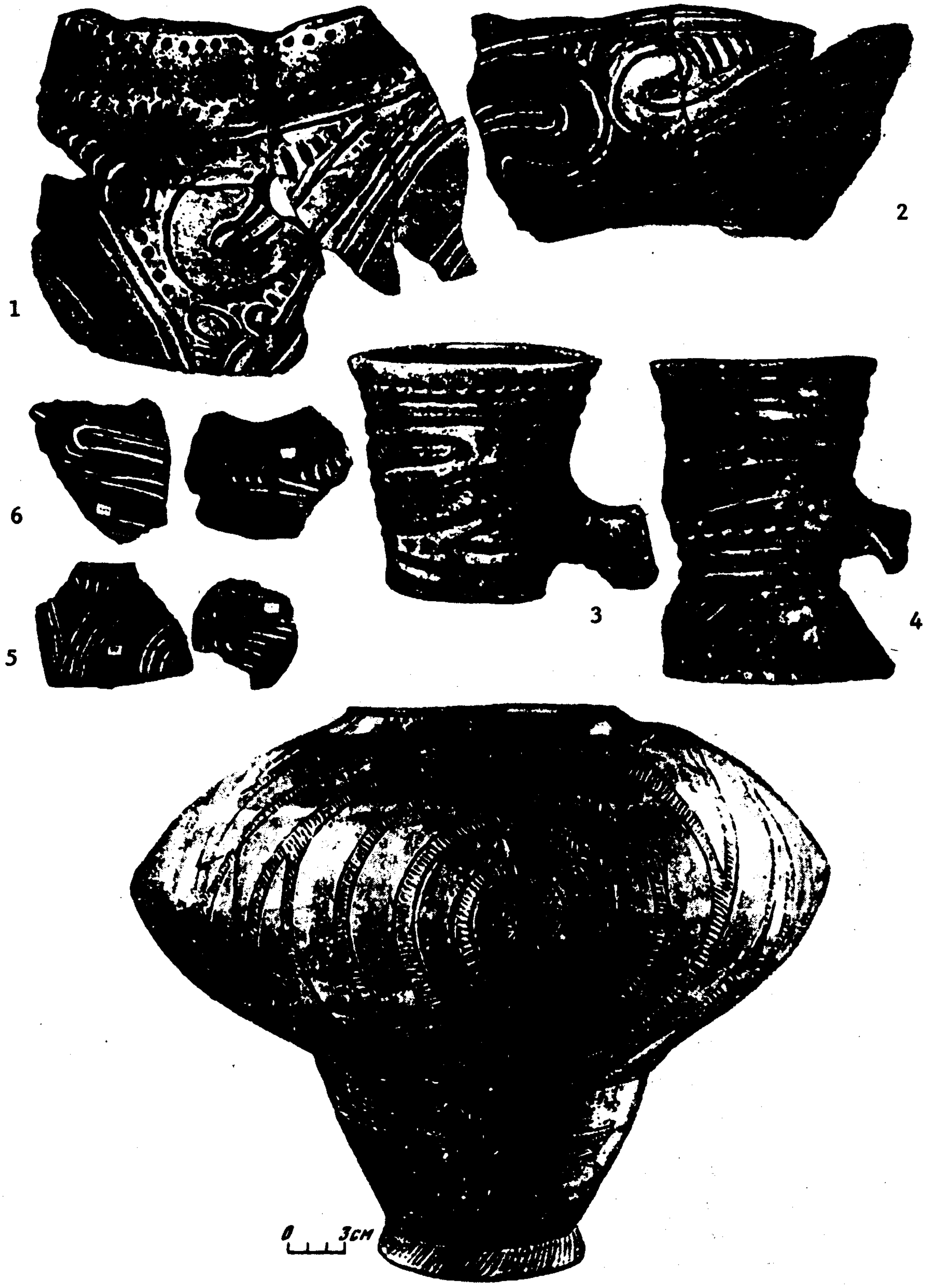


Fig. 5 Incised/excised ceramics from Krasnostavka (nos. 1-4; ½ natural size) and JAblonovka (nos. 5 and 6; 1/5 natural size) and Lenkovtsy (lower).

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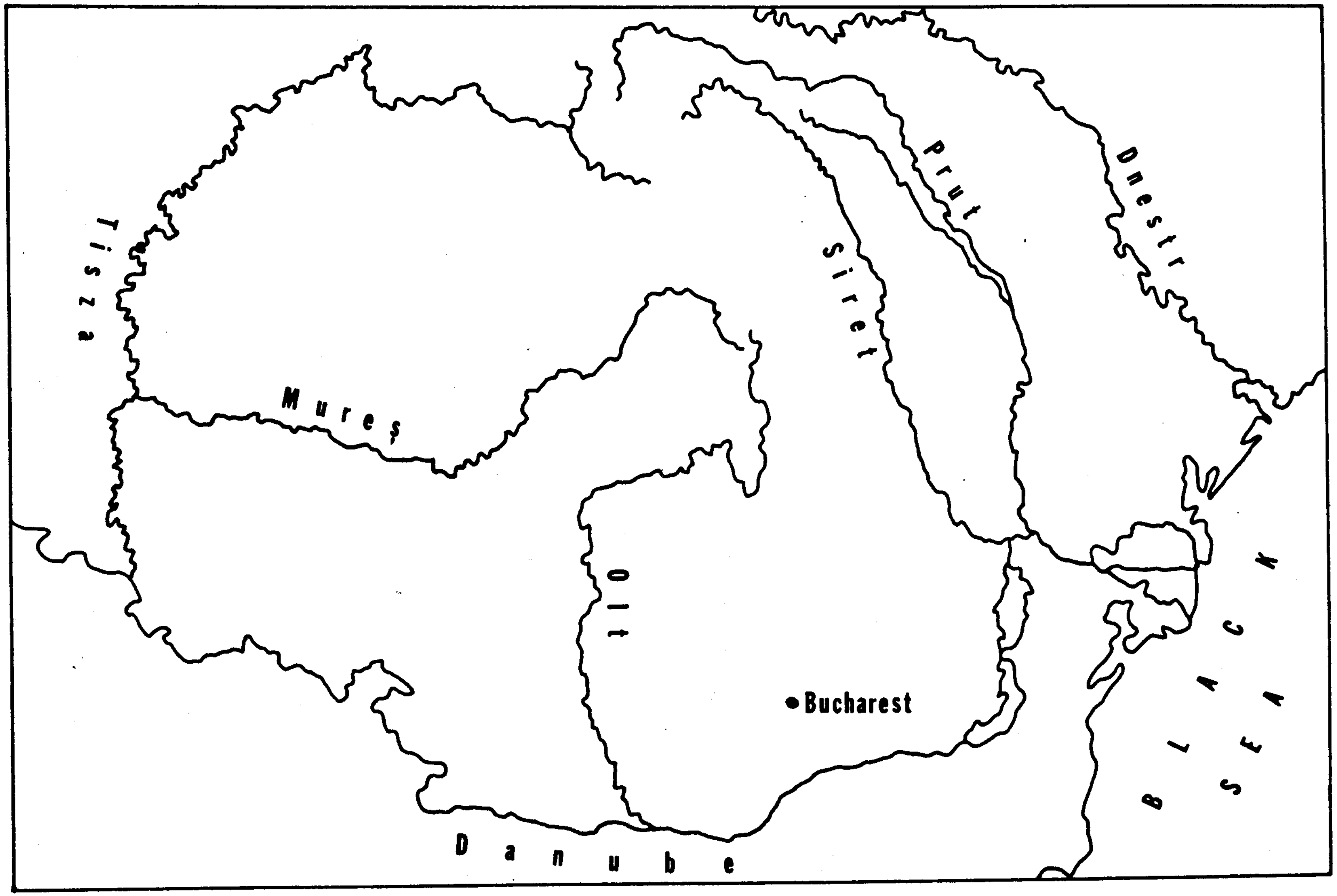
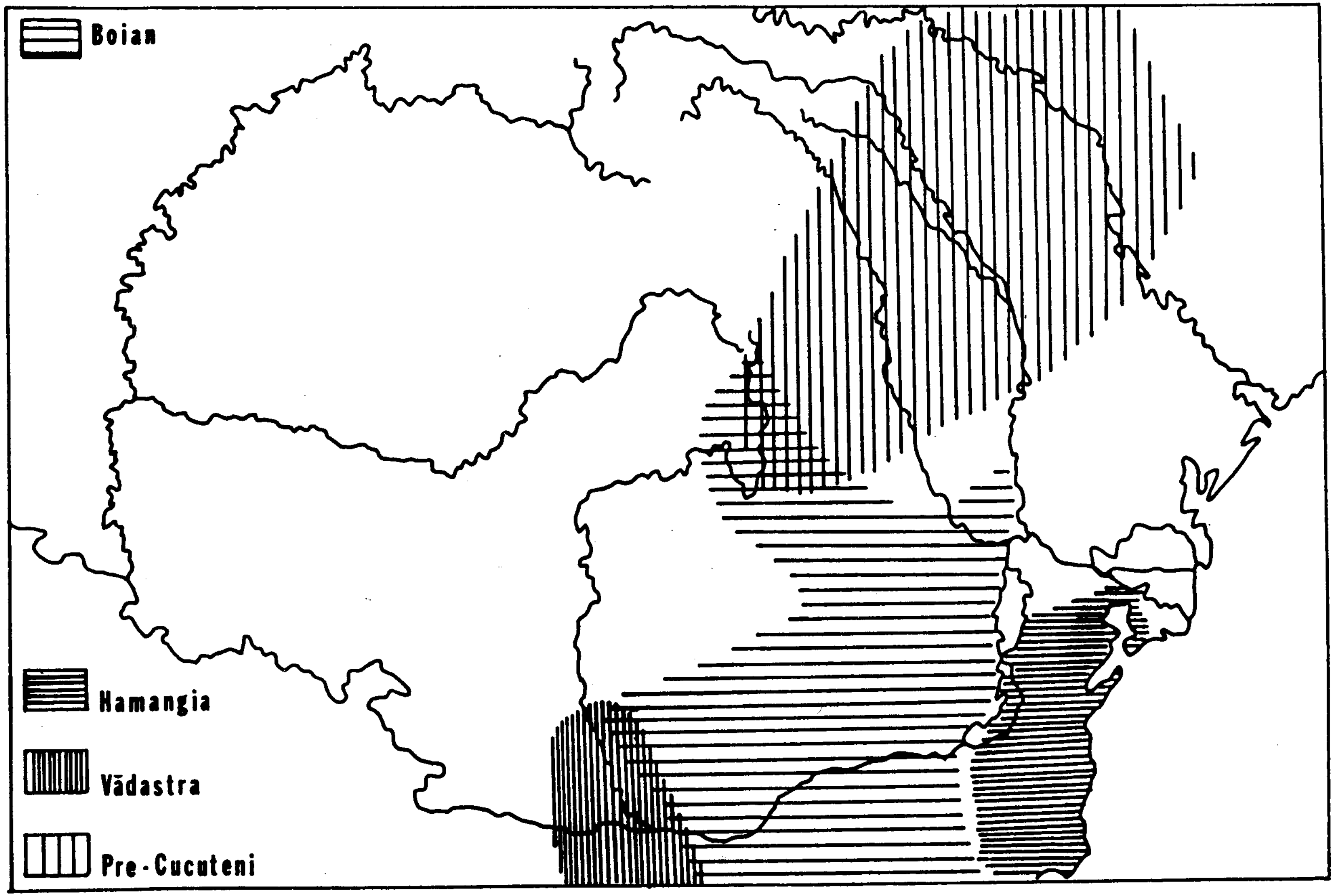
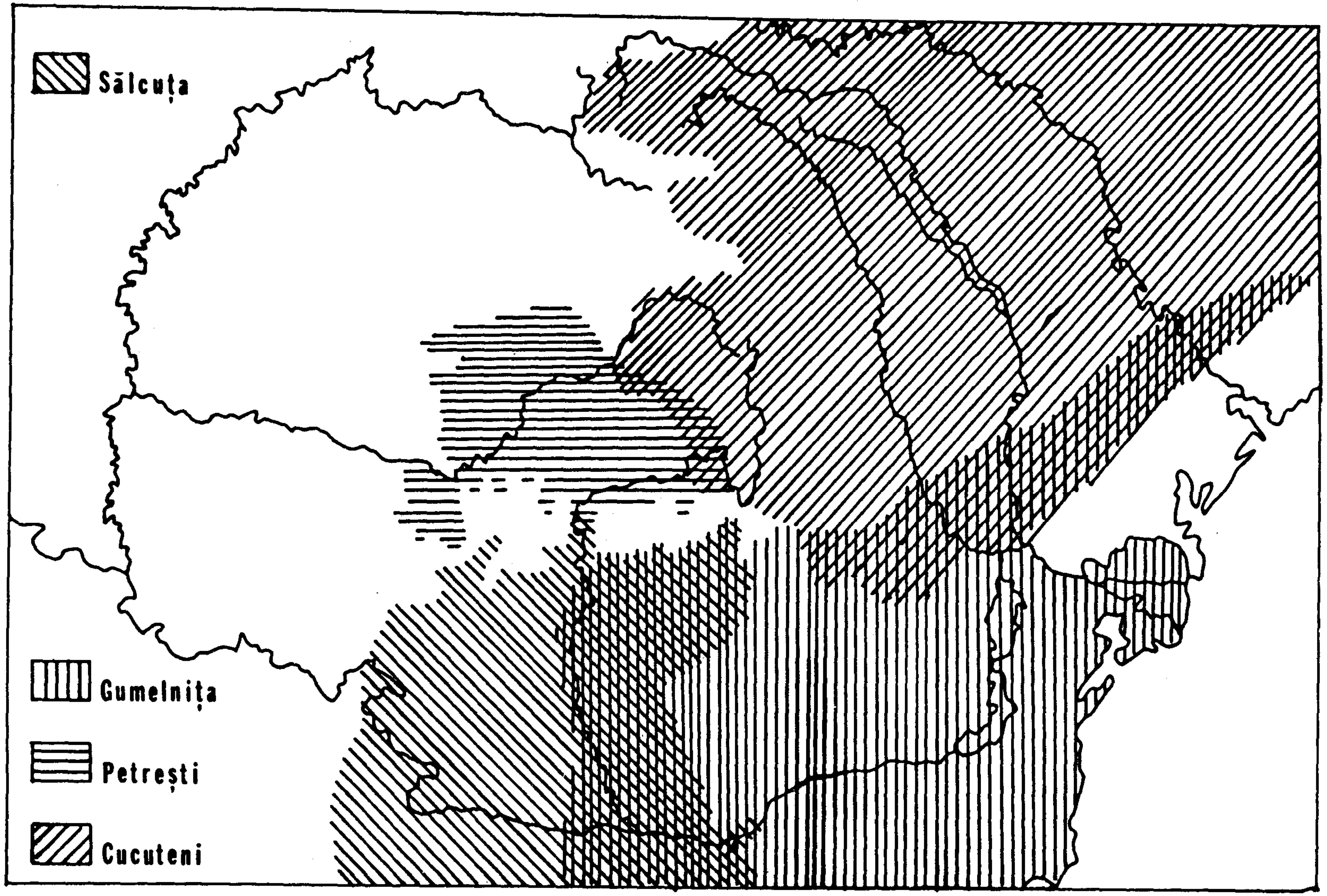


Map 3 Major rivers

DE ARHEOLOGIE



Map 4 Late Neolithic Cultures



Map 5 Chalcolithic Cultures

### II.B.1. Pre-Cucuteni/Tripolye A chronology

Fig. 1 places the Pre-Cucuteni period in its relative chronological context with neighbouring cultures. As to absolute chronology, unfortunately very few radiocarbon dates exist for Neolithic cultures in Romania and the Soviet Union (table 1). For the late phase ("Notenkopf") of the Linear Pottery culture in Romania, which precedes Pre-Cucuteni (vide infra), two dates are available: 4220 b.c. and 4295 b.c. (table 1). For Pre-Cucuteni III in Romania, a date of 3580 b.c. has been obtained from Tirpeşti and for Tripolye A (=Pre-Cucuteni III) in the USSR, at Novye-Rusešty I (Ruseştii Noi), 3615 b.c.

### II.B.2. Settlement location and building construction

The choice of settlement location was rather erratic throughout the Pre-Cucuteni period. One constant feature is the location of sites on river terraces; however, there was no predilection as to the advantages offered by positions that were higher in elevation, and Pre-Cucuteni villages may be found on low, middle and high terraces, as well as in valleys, depressions, and river islands (Marinescu-Bîlcu 1974).

Much has been said about the fortification of sites in this early period. While the word "fortification" may have applicability to later Cucuteni-Tripolye sites, during the Pre-Cucuteni period we must restrict ourselves to the word "trench" and assume a more modest function for these features. These trenches, enclosing the area of settlement, measure 1.4-1.9 m in depth, 98-300 m in length, and 1.2-5 m in width (Marinescu-Bîlcu 1974). No remains of any construction (such as a wall or fence) have been found in these trenches, and the contents include usual debris of stones, bones, sherds, tools, etc.

During Pre-Cucuteni I and II, surface dwellings were built without a platform were rectangular in shape and measured 3 x 5 m; sometimes an extra room was added which measured 3 x 2 m (Marinescu-Bîlcu 1974). Large beams were securely laid on the ground, forming the base of each wall. Poles, 10-15 cm thick, were inserted vertically into the beams about 1 m apart. These poles, when wattle-and-daub was applied, formed the walls of the house and supported a thatched, gabled roof (Marinescu-Bîlcu 1981). Towards the Pre-Cucuteni III phase, the preparation of platforms before actual house construction became more prevalent; large logs were placed on levelled ground perpendicular to the long axis of the house. A layer of clay 15-25 cm thick, with a chaff, sand or gravel admixture, covered the log platform. Prior to construction of the walls, the platforms were sometimes intentionally fired. Walls and roof were constructed as described above (Marinescu-Bîlcu 1981).

### II.B.3. Economy

Pre-Cucuteni settlements reveal a mixed economy with both wild and domestic species of animals as well as a variety of domestic grains. Table 2 summarises the published data on animal bones from eight Pre-Cucuteni III (=Tripolye A) sites and one Pre-Cucuteni I site (data

## Table 1

## RADIOCARBON DATES FOR LINEAR POTTERY (in Romania)

| site | culture | lab no. | date B.P.* | date b.c./B.C.+ | reference |
|---|---|---|---|---|---|
| Tîrpeşti | Linear Pottery | Bln-800 | 6170 ± 100 | 4220/5330-4915 | (Dumitrescu 1974) |
| Tîrpeşti | Linear Pottery | Bln-801 | 6245 ± 100 | 4295/5425-4945 | (Dumitrescu 1974) |

* date B.P. = date before present, i.e. 1950

+ date b.c. = date before present minus 1950, uncalibrated radiocarbon date
date B.C. = date before present minus 1950 and calibrated according to a consensus of laboratories (See Klein, et al. 1982)

Table 1 (continued)

## RADIOCARBON DATES FOR CUCUTENI/TRIPOLYE

| site | culture/phase | lab no. | date B.P. | date b.c./B.C. | reference |
|---|---|---|---|---|---|
| Romania: | | | | | |
| Tîrpeşti I | Pre-Cucuteni III | GrN-4424 | 5530 ± 85 | 3580/4555-3980 | (Vogel & Waterbolk 1972) |
| Mărgineni | Cucuteni A2 | Bln-1536 | 5625 ± 50 | 3675/4560-4395 | (Monah 1978) |
| Mărgineni | Cucuteni A2 | Bln-1554 | 5610 ± 55 | 3660/4560-4390 | (Monah 1978) |
| Mărgineni | Cucuteni A2 | Bln-1535 | 5485 ± 60 | 3535/4480-3975 | (Monah 1978) |
| Hăbăşeşti | Cucuteni A3 | GrN-1985 | 5330 ± 80 | 3380/4415-3875 | (Vogel & Waterbolk 1963) |
| Leca-Ungureni | Cucuteni A3 | Bln-795 | 5345 ± 100 | 3395/4420-3880 | (Dumitrescu 1974) |
| Drăguşeni | Cucuteni A final | Bln-1060 | 5355 ± 100 | 3405/4420-3880 | (Dumitrescu 1974) |
| Valea Lupului | Cucuteni B2 | GrN-1982 | 4950 ± 60 | 3000/3895-3640 | (Vogel & Waterbolk 1963) |

Table 1 (continued)

USSR:

| | | | | | |
|---|---|---|---|---|---|
| Novye-Rusešty I | Tripolye A | Bln-590 | 5565 ± 100 | 3615/4560-4115 | (Quitta & Kohl 1969) |
| Kliščev | Tripolye B I-B II | LE-1060 | 5100 ± 50 | 3150/4105-3675 | (Dolukhanov et al. 1976) |
| Polivanov JAr III | Tripolye B I | GrN-5134 | 5440 ± 70 | 3490/4430-3945 | (Vogel & Waterbolk 1972) |
| Čapaevka | Tripolye C I | Bln-631 | 4870 ± 100 | 2920/3885-3375 | (Quitta & Kohl 1969) |
| Evminka I | Tripolye C II | UCLA-1466B | 4790 ± 100 | 2840/3855-3360 | (Kruts 1977) |
| Danku | Tripolye γ II | LE-1054 | 4600 ± 60 | 2650/3535-3150 | (Dolukhanov et al. 1976) |
| Majaki | Tripolye γ II | Bln-629 | 4400 ± 100 | 2450/3370-2880 | (Kohl & Quitta 1970) |
| Majaki | Tripolye γ II | LE-645 | 4340 ± 65 | 2390/3350-2880 | (Dolukhanov et al. 1970) |

Table 2. Archaeozoological data from Pre-Cucuteni and Tripolye A sites.

| | Traian-Dealul Viei | | Tîrpeşti | | Karbuna | | Lenkovtsy | | Sabatinovka II | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. of individuals | % of total | No. | % | No. | % | No. | % | No. | % |
| Cattle (*Bos taurus*) | 32 | 47.07 | 150 | 49.18 | 11 | 31.42 | 30 | 25.86 | 22 | 25.58 |
| Sheep-goat (Ovicaprinae) | 5 | 7.63 | 50 | 16.39 | 7 | 20.00 | 10 | 8.62 | 11 | 12.79 |
| Pig (*Sus scrofa domesticus*) | 6 | 8.82 | 60 | 19.67 | 6 | 17.14 | 19 | 16.37 | 10 | 11.62 |
| Dog (*Canis familiaris*) | 3 | 4.41 | 3 | 0.98 | 1 | 2.85 | 2 | 1.72 | 1 | 1.16 |
| Total DOMESTIC Animals | 46 | 67.65* | 263 | 86.23 | 25 | 71.41 | 61 | 52.57 | 44 | 51.15 |
| Horse (*Equus przewalski* and/or *E. caballus*) | -- | -- | 3 | 0.98 | 4 | 11.42 | 5 | 4.31 | 9 | 10.46 |
| Red deer (*Cervus elaphus*) | 12 | 17.65 | 21 | 6.89 | 2 | 5.71 | 25 | 21.55 | 8 | 9.30 |
| Roe deer (*Capreolus capreolus*) | 2 | 2.94 | 6 | 1.97 | 2 | 5.71 | 9 | 7.75 | 4 | 4.65 |
| Wild pig (*Sus scrofa ferus*) | 4 | 5.88 | 3 | 0.98 | 2 | 5.71 | 9 | 7.75 | 3 | 3.48 |
| Other wild animals | 2 | 2.94 | 9 | 2.95 | - | - | 7 | 6.03 | 18 | 20.93 |
| Total WILD Animals | 20 | 29.41 | 42 | 13.77 | 10 | 28.55 | 55 | 47.39 | 42 | 48.82 |

* Not including the category '*Sus scrofa* (?)'

Table 2 (continued)

| | Luka-Vrublevetskaja | | Bernovo-Luka | | Solončeny I | | Golerkany | |
|---|---|---|---|---|---|---|---|---|
| | No. of individuals | % of total | No. | % | No. | % | No. | % |
| Cattle (*Bos taurus*) | 42 | 10.68 | 23 | 19.49 | 17 | 16.50 | 5 | 16.12 |
| Sheep-goat (Ovicaprinae) | 38 | 9.66 | 9 | 7.62 | 14 | 13.59 | 4 | 12.90 |
| Pig (*Sus scrofa domesticus*) | 93 | 23.66 | 11 | 9.32 | 19 | 18.44 | 1 | 3.22 |
| Dog (*Canis familiaris*) | 12 | 3.05 | 1 | 0.84 | 2 | 1.94 | - | - |
| Total DOMESTIC Animals | 185 | 47.05 | 44 | 37.27 | 52 | 50.47 | 10 | 32.24 |
| Horse (*Equus przewalski* and/or *E. caballus*) | 4 | 1.01 | 2 | 1.69 | 3 | 2.91 | 3 | 9.67 |
| Red deer (*Cervus elaphus*) | 57 | 14.50 | 25 | 21.18 | 20 | 19.41 | 6 | 19.35 |
| Roe deer (*Capreolus capreolus*) | 31 | 7.88 | 17 | 14.40 | 7 | 6.79 | 2 | 6.45 |
| Wild pig (*Sus scrofa ferus*) | 33 | 8.39 | 17 | 14.40 | 15 | 14.56 | 6 | 19.35 |
| Other wild animals | 83 | 21.11 | 13 | 11.01 | 6 | 5.82 | 4 | 12.90 |
| Total WILD Animals | 208 | 52.89 | 74 | 62.68 | 51 | 49.49 | 21 | 67.72 |

(Data from: Necrasov and Haimovici 1962; Necrasov and Ştirbu 1981; Tsalkin 1970) modified from Necrasov and Haimovici 1962; Necrasov and Ştirbu 1981; and Tsalkin 1970). Cattle (*Bos taurus*) clearly predominates the domestic species, except at Solončeny (Solonceni) and Luka-Vrublevetskaja where pig exceeds the number of cattle. The two Romanian sites--Tîrpesţti and Traian-Dealul Viei--as well as Karbuna (Cărbuna) have a much higher percentage of domestic vs. wild species; Sabatinovka, Solončeny, Luka-Vrublevetskaja, and Lenkovtsy have approximately equal percentages of domestic and wild animals; while Golerkany and Bernovo-Luka have an almost 2:1 ratio of wild vs. domestic species. As for the exploitation of wild animals, red deer (*Cervus elaphus*) clearly predominates at almost every site.

Among the domestic plant species during this period, einkorn (*Triticum monococcum*) has been found at the Pre-Cucuteni III sites of Traian-Dealul Fîntînilor and Tîrpeşti. At Tripolye A sites between the Prut and the Dnestr Rivers (i.e. Soviet Moldavia), a variety of domestic cereals have been identified: einkorn (*T. monococcum*), emmer (*T. dicoccum*), spelt wheat (*T. spelta*), club wheat (*T. compactum*), as well as barley (*Hordeum vulgare*), cultivated oat (*Avena sativa*), millet (*Panicum miliaceum*), and peas (*Pisum sativum*) (Comşa 1981).

### II.B.4. Cultural origins and interaction sphere of Pre-Cucuteni

It is currently the consensus of opinion that the Pre-Cucuteni period evolved from the amalgamation of two principle elements: the latest phase ("Notenkopf") of the Linear Pottery culture and the middle phase ("Giuleşti") of the Boian culture (cf. map 4 and fig. 1). These identifications of origins are based mainly on the tracing of decorative elements on Pre-Cucuteni ceramics to analogues on the ceramics of the two aforementioned cultures.

In identifying a linkage between the earliest occurrence of Pre-Cucuteni and the latest phase of the Linear Pottery culture, a persistent problem has always been present: i.e., horizontal stratigraphy. Until very recently, no site was found that comprised a Linear Pottery level below that of Pre-Cucuteni I, thus preventing the delineation of any interrelationships that might exist between the two cultures. With the discovery, excavation and publication of Tîrpeşti, which has revealed one Linear Pottery house and nine pits with Linear Pottery ceramic material together with occupation levels of Pre-Cucuteni II and III, some confirmation of the genesis of Pre-Cucuteni is now in sight (Marinescu-Bîlcu 1981).

As to identifying common elements of ceramic decoration, there is a connection between Pre-Cucuteni and Linear Pottery based on the overall spiralic nature of Pre-Cucuteni ceramic decoration, the occurrence of wide bands filled with points, as well as series of points, as well as series of points placed liberally or transversal on a band of incised lines, and the use of schematised anthropomorphic figures. In addition, Marinescu-Bîlcu (1974) has mentioned that the idea of using trenches to surround Pre-Cucuteni settlements derived from the Linear Pottery culture and not from the neighboring Boian culture which did not employ trenches until its latest ("Vidra") phase.

Although most scholars are of the opinion that the Linear Pottery culture did contribute to the formation of Pre-Cucuteni, there are some problems to be considered. First, the small number of sites with Pre-Cucuteni I material (five) does not overwhelmingly justify the designation of a specific Pre-Cucuteni I phase as a unit of time, which was, as stated earlier, defined on the basis of finds from a single site and, in the future, may be determined to be a synchronic variation. With the existence of a separate "Pre-Cucuteni I" phase as a chronological stage put into question, the time gap between Linear Pottery and Pre-Cucuteni II is unsure (especially since only a single Linear Pottery pit dwelling has been found in connection with a Pre-Cucuteni II settlement at Tîrpeşti)--a situation accentuated by horizontal stratigraphy. And, finally, the technique used in decorating Linear Pottery and Pre-Cucuteni vessels is quite different: The former used the incising technique exclusively; to be sure Pre-Cucuteni pottery does exhibit incising, but much of the decoration of Pre-Cucuteni I and II also consists of excising--a hallmark of the Boian culture.

The influence of the Boian culture ("Giuleşti" phase) in the formation of Pre-Cucuteni appears more prominent in terms of decorative motifs, technique of execution, and the variety of vessel shapes.

Individual decorative motifs which were inherited from the Boian culture are the geometric series of triangles ("wolf's teeth"), rhomboids, and "chessboard" designs. The rendition of all of these motifs using excision in the Pre-Cucuteni and Boian cultures was already noted above. In addition, the inventory of vessel shapes in Pre-Cucuteni ceramics is significantly more varied than in the preceding Linear Pottery culture, again possibly reflecting Boian influence, especially in reference to deep cups, bowls, and lids with knobs (figs. 3 and 4). Finally, Pre-Cucuteni vase profiles appear with narrower and more angular shoulders than seen in Linear Pottery (Marinescu-Bîlcu 1974:85). Also, it is suggested here that the channeling decoration which occurs in all Pre-Cucuteni phases was also derived from the Boian culture where the technique is so prevalent and very finely executed (cf. Comşa 1974c).

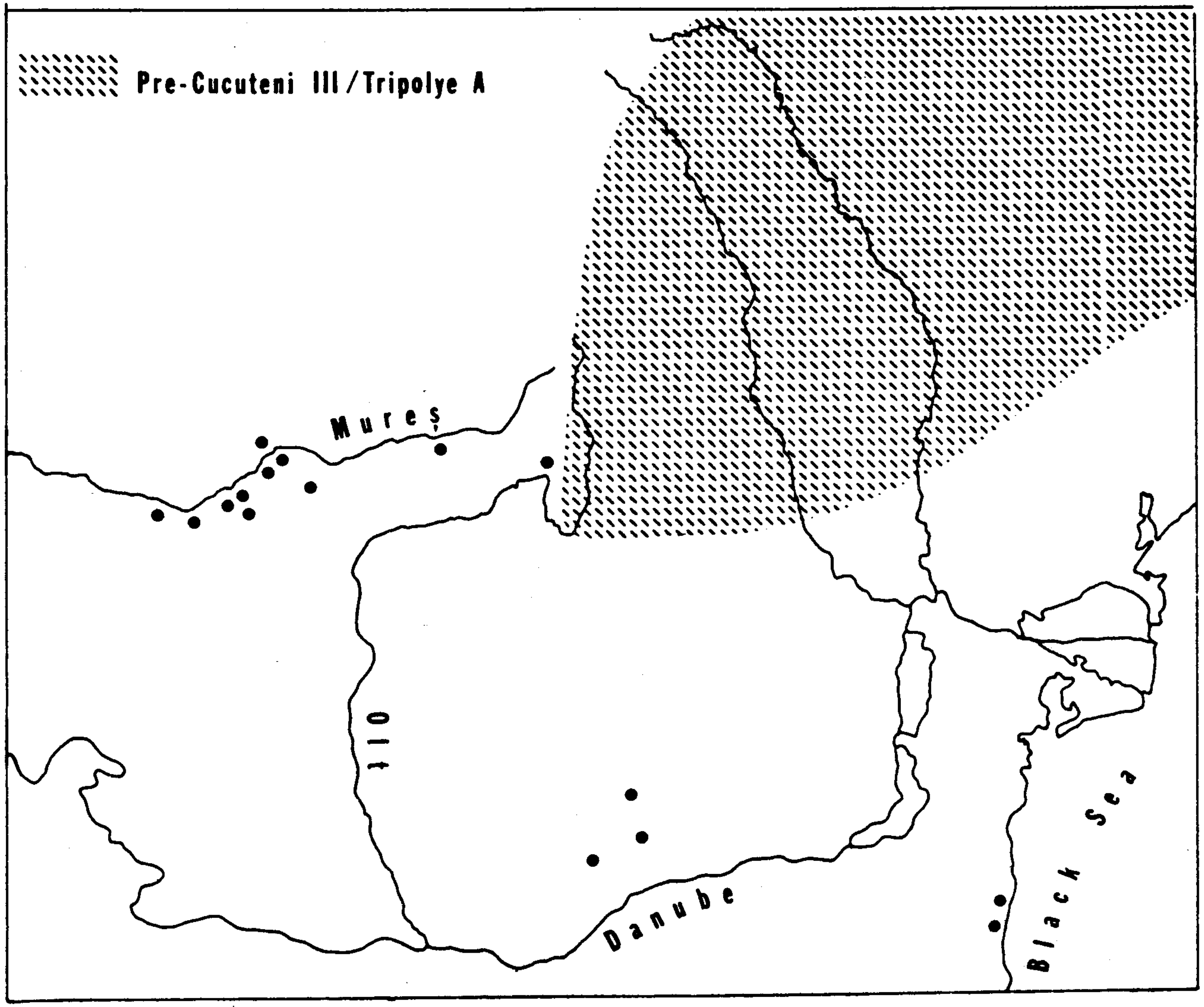
The most current consensus on the area of formation of the Pre-Cucuteni culture is southeastern Transilvania and southwestern and central western Moldova (Comşa 1974b; Marinescu-Bîlcu 1974). In southeastern Transilvania especially, the Linear Pottery culture, Boian culture, and the Pre-Cucuteni I phase are all found (Marinescu-Bîlcu 1974:127). Marinescu-Bîlcu (1974) is correct in stating that the actual path of penetration of the Boian culture into Moldova is not yet known; but the role of this culture in the genesis of Pre-Cucuteni cannot be disputed, and Comşa (1974b) draws a tentative connection between northeastern Muntenia and western Moldova. But judging by the distribution of Boian sites (cf. Comşa 1974c:fig. 10) and the presence of all three cultures in Transilvania, the comments of H. Dumitrescu (1957) that the Pre-Cucuteni culture appears to have arrived in Moldova from the west (i.e. Transilvania) almost fully formed do have considerable merit. Until more sites are discovered and excavated in southern Moldova that show more penetration of the Boian culture into this region or the appearance of more transitional Boian-Pre-Cucuteni forms, and until absolute dating methods are used to clarify the relationships between the three cultures both in Transilvania and in Moldova, the evidence strongly suggests that Pre-Cucuteni genesis occurred in southeastern Transilvania from the contributions of the Boian and Linear Pottery cultures, with subsequent gradual population movement across the Carpathians and farther to the northeast. The major problem involved in this particular assignment of origins is the paucity of material with which to work: Not all counties have been equally surveyed and documented archaeologically, especially for the beginning of the Pre-Cucuteni period, such that any cultural derivation, or periodisation, will have to remain flexible.

Ceramics, either whole vessels or sherds, of the Pre-Cucuteni period have been found in other contexts to the west, southeast, and south, giving some indication of contact with other cultures (map 6).

To the southeast, in Dobrogea, the Pre-Cucuteni tribes had contact with the Hamangia culture (map 4; fig. 2). In 1972, S. Marinescu-Bîlcu published a group of Pre-Cucuteni III biconical vases, footed vases, and vessel supports; this pottery was discovered in very good condition from some unknown site(s) in Dobrogea, probably at the turn of the century, and formed part of the G. Solacolu collection until 1948. This pottery is indisputably Pre-Cucuteni and has good analogies with the Pre-Cucuteni III site of Traian-Dealul Fîntînilor. This collection together with other Pre-Cucuteni finds at Mangalia, Limanu, and other Hamangia sites in Dobrogea indicate contact between the two cultures (Marinescu-Bîlcu 1972).

Likewise, there are contacts between Pre-Cucuteni III, the Boian culture and the early period of the Gumelniţa culture directly to the south. In the context of the last phase ("Vidra") of the Boian culture and the transitional phase between the Boian and Gumelniţa cultures (cf. fig. 1), several Pre-Cucuteni II and III sherds have been found at Tangîru (Berciu 1961; Marinescu-Bîlcu 1976). At the site of Vidra, a Pre-Cucuteni III vessel support appeared at this early Gumelniţa settlement (Rosetti 1934:fig. 25). A biconical vase with a tall, cylindrical neck and decoation typical of Pre-Cucuteni III was reported at Măgurele (Roman 1963:fig. 2/2). In the opposite direction, ceramics and sherds of the Gumelniţa type with "barbotine" decoration (i.e. very rough, vertical furrows) have been found in the Pre-Cucuteni III levels at Tîrpeşti and Traian-Dealul Fîntînilor (Marinescu-Bîlcu 1974:84 and fig. 69/6).

Finally, in central Transilvania, Pre-Cucuteni II sherds with the "wolf's teeth" and "chessboard" designs have been found on the sites of Poiana în Pisc, Ocna Sibiului, Mihalţ, Daia Romana, and others--all belonging to the Turdaş culture (cf. fig. 1). Pre-Cucuteni I and II materials have also been found in the context of the Petreşti culture at Lumea Noua and the eponymous site of Petreşti. These early contacts to the west with the Petreşti culture are particularly significant, since it is the trichrome pottery of this culture that is thought to have been the greatest influence on the origin of pre-fire painting in the Cucuteni-Tripolye culture (Paul 1981; V. Dumitrescu 1963a).



Map 6 ● Pre-Cucuteni pottery on sites of the Petrești, Gumelnița, and Hamangia Cultures

## II.C. The Cucuteni sequence

Following the Pre-Cucuteni/Tripolye A period, the Cucuteni-Tripolye culture underwent tremendous areal and population expansion: At first, occupation was limited to former Pre-Cucuteni III territory, thereafter later materials are found easterly towards the Dnepr River and in the final phases are found even farther east beyond the Dnepr, northwards into Podolia, and southwards near the Black Sea, covering an area approximately 280,000 sq. km. (maps 7-10).

### II.C.1. History of research on painted wares

Due to the history of archaeological research on this culture (cf. section II.A.), two independently created relative chronologies exist for Cucuteni-Tripolye (fig. 6). While, understandably, the Romanians use the "Cucuteni" sequence and the Soviet scholars use the "Tripolye" sequence, in western literature there has been the inconsistent use of one, the other, or even both terminologies. In addition, excavations prior to World War I in Transilvania were made by Hungarian archaeologists who named this culture "Erösd" (or "Ariuşd" in Romanian) after the eponymous site (map 7). This name--Erösd/Ariuşd--will still be encountered in the literature but now is considered synonymous with the period "Cucuteni A" and forms the westernmost branch of the Cucuteni-Tripolye culture. This is an unfortunate and confusing situation which has not been remedied even after many years of research and which must be confronted in order to discuss all relevent materials. In this work, there is a slight bias in favor of the use of the "Cucuteni" sequence terminology for three reasons: 1) This culture first evolved and developed in southeastern Transilvania and eastern Romania; 2) the longest chronological sequence occurs between the Eastern Carpathians and the Prut River (i.e. Moldova); and, 3) the Cucuteni ceramic typology was the most clearly defined relative chronology and was based on systematic, multi-level excavations (cf. Schmidt 1911; 1932). However, due to the voluminous literature on either side, the only solution now is the cumbersome use of both terminologies.

The periodisation of the Romanian materials begins with the previously discussed Pre-Cucuteni period which is defined on the basis of incised/excised wares. The appearance of painted ceramics marks the beginning of the "Cucuteni" sequence. For the purpose of establishing a relative chronology, this sequence has been subdivided by H. Schmidt, and supported by general consensus, into three periods: Cucuteni A, Cucuteni AB, and Cucuteni B. These subdivisions are based on three criteria: the kinds of paints that are used, the repertoire of motifs, and how decorative patterns are placed on the vessel.

In the process of creating the relative chronology, Hubert Schmidt had evidently felt that the ceramic material needed further classification beyond the "Cucuteni A, AB, B" scheme. Since the artistic style had changed so dramatically after the Cucuteni A period, Schmidt had decided to create a separate typology for the Cucuteni AB and B ceramics, which was based on artistic style. The pottery was found to cluster into six groups, or "styles", which were designated by the Greek letters: α, β, γ, δ, ε, and ζ so as not to cause confusion with the chronological classification. Schmidt's six styles were the result of

| CUCUTENI | TRIPOLYE | Predominant Ceramic Type |
|---|---|---|
| Horodiştea-Folteşti | (Gorodsk-Usatovo) Tripolye C II/γ II | Corded Ware |
| Cucuteni B | Tripolye C I/γ I | Monochrome Ware |
| Cucuteni AB | Tripolye B II | Trichrome Ware |
| Cucuteni A | Tripolye B I | |
| Pre-Cucuteni III | Tripolye A | Incised/ Excised Ware |
| Pre-Cucuteni II<br>Pre-Cucuteni I | | |

Fig. 6 Schematic synchronization of parallel Romanian and Ukrainian ceramic sequences. Cucuteni sequence after Schmidt 1932 and V. Dumitrescu 1963a; Tripolye sequence after Passek 1949.

an incredibly meticulous study but later were refined even further by V. Dumitrescu (1941-1944). Moreover, every publication since 1932 on Cucuteni AB and B sites in Romania has used Schmidt's six styles in order to categorise the materials (figs. 18-24).

The straightforward relative chronology and the "style" typology proposed by Schmidt would cause, inadvertently, innumerable problems not only in classifying ceramic materials but also in understanding technological development. Part of the problem involves the later subdivision of the AB and B periods into AB1, AB2, B1, B2, and B3 by V. Dumitrescu; and subsequently the six styles were assigned chronological values in order to support the subdivisions (V. Dumitrescu 1963b). However, in trying to divide the six styles among the various numbered phases, there is so much overlapping as to render the task meaningless. The situation is even more complicated by further subdivision of the styles themselves by Schmidt (1932), V. Dumitrescu (1941-1944), and Niţu (1980) into approximately 20 numbered "sub-styles". And when discussing these 20 subdivisions, it is quite common for as many as four styles to occur on the same vessel, thus further destroying any remaining chronological value (figs. 25 and 26).

However, the division of the Cucuteni painted wares into periods A, AB, and B is a viable chronological scheme and works well on a widespread basis, since the painting technique and overall decoration do change radically and are readily discernible. Moreover, Schmidt's original scheme has been proven stratigraphically and has been used effectively for over 50 years. Problems only begin to arise when one subdivides these periods, since there is a crucial point that has been overlooked: regional variation (section II.C.4).

## II.C.2. Cucuteni ceramic typology

In the first ("A") period, there is a brief appearance of bichrome (white on red) ware after which trichrome ware with white, red, and black mineral-based paints clearly predominates (2). The decoration usually consists of a single, repetitive geometric or curvilinear motif that covers most, if not all, of the exterior surface, as well as many times the interior of the vessel (figs. 11-13) (3).

Trichrome painting continues into Cucuteni AB and a new bichrome ware (black on white, and vice versa) makes its appearance. But the defining characteristic of this middle period are the radical changes in which space is used on the vessel surface and the proliferation of geometric and curvilinear motifs: Instead of a uniform pattern covering the entire surface, space is divided horizontally into as many as four panels or friezes, each with its own design, and placed according to the contours of the vessel (figs. 18-22) (4).

The last ("B") period again involves radical changes: More of the surface remains unpainted than in previous periods, many times limited to just a single narrow frieze near the rim or shoulder of the vessel (figs. 22-24 and 27-29). What decoration exists is painted many times only in monochrome black; although there develops a new bichrome style (red and black) at this time. Geometric and curvilinear designs continue, but the most interesting additions are the many zoomorphic and

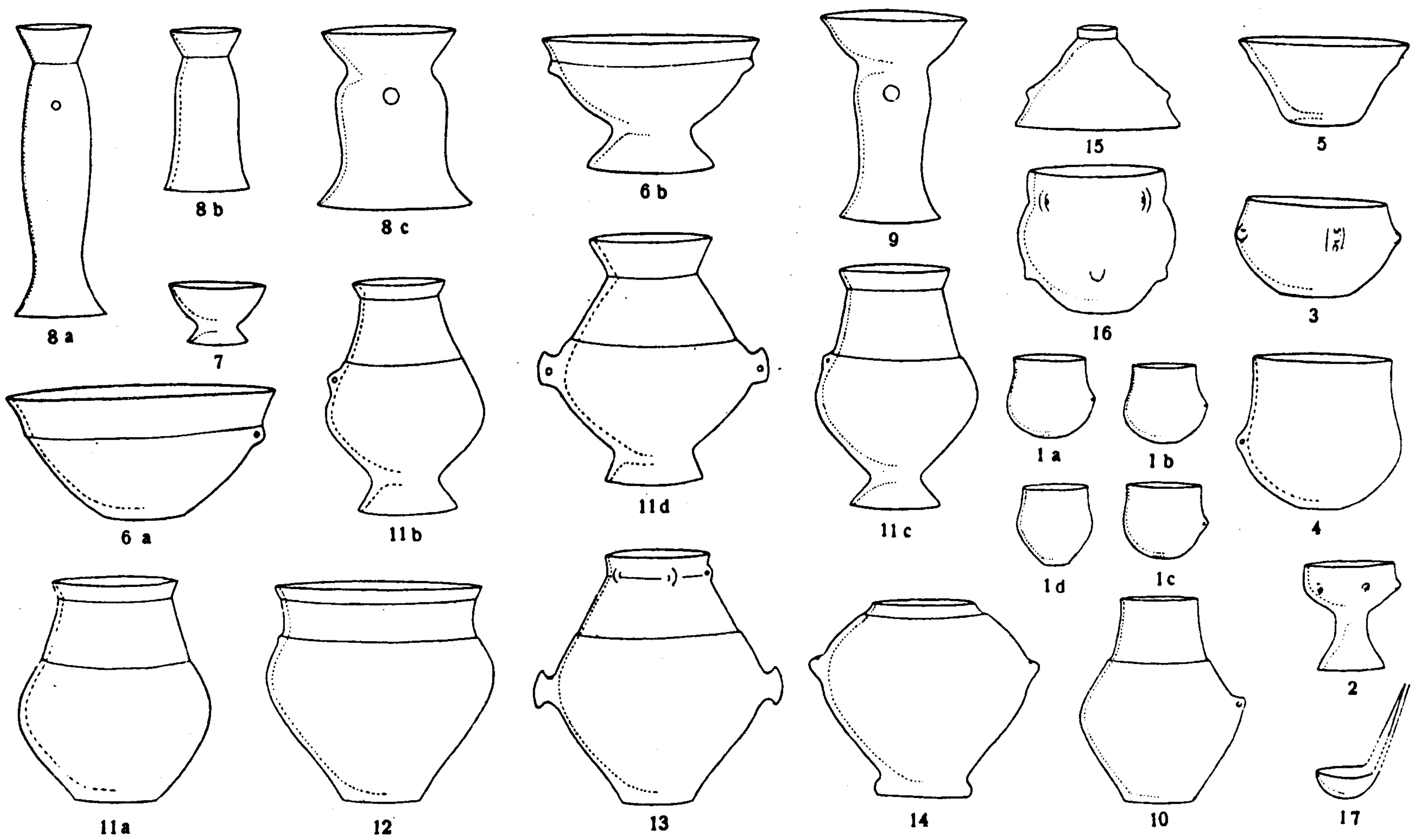


Fig. 7 Cucuteni A vessel shapes from the eponymous site, Cucuteni.

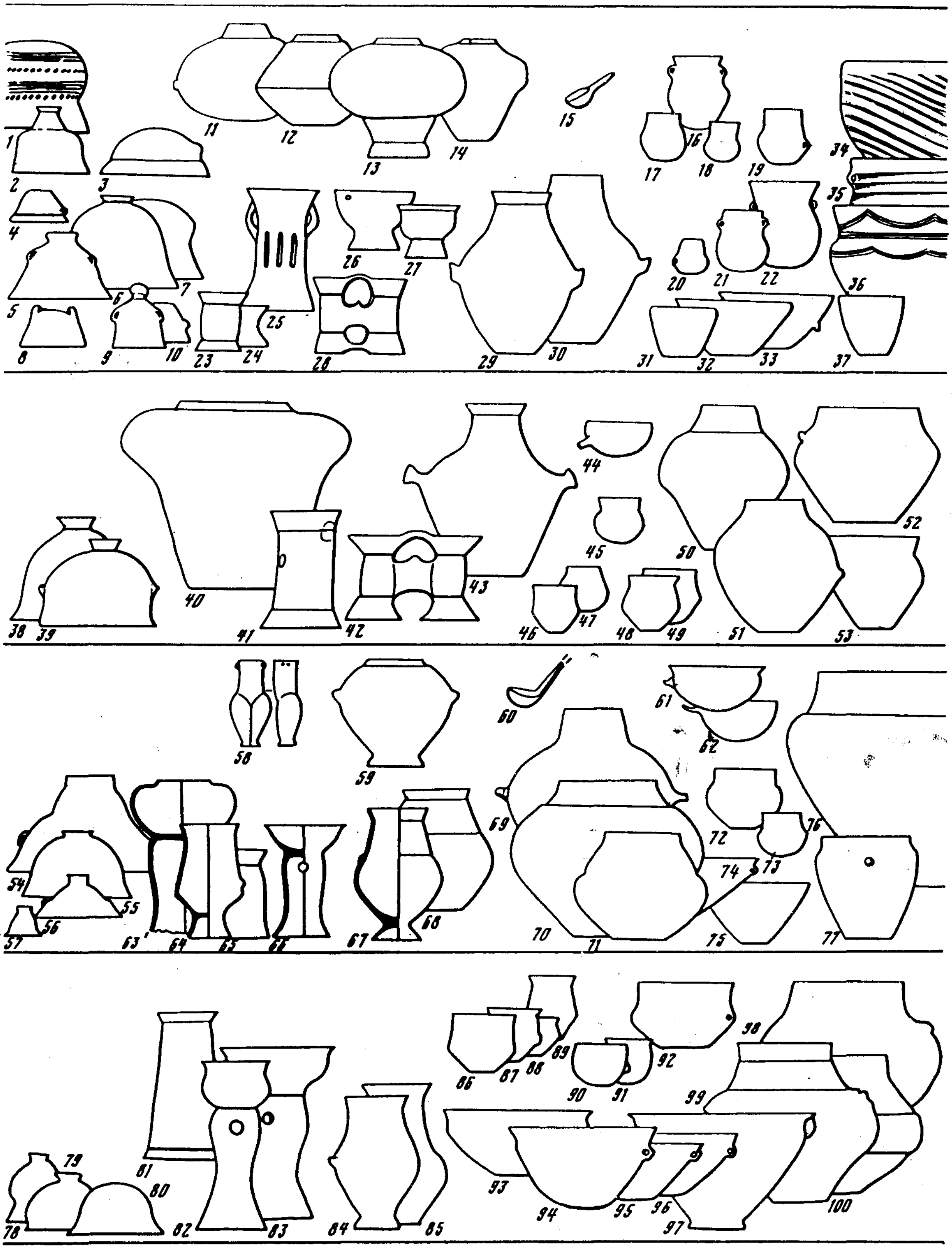


Fig. 8 Cucuteni A/Tripolye B I vessel shapes from Romania and the USSR.

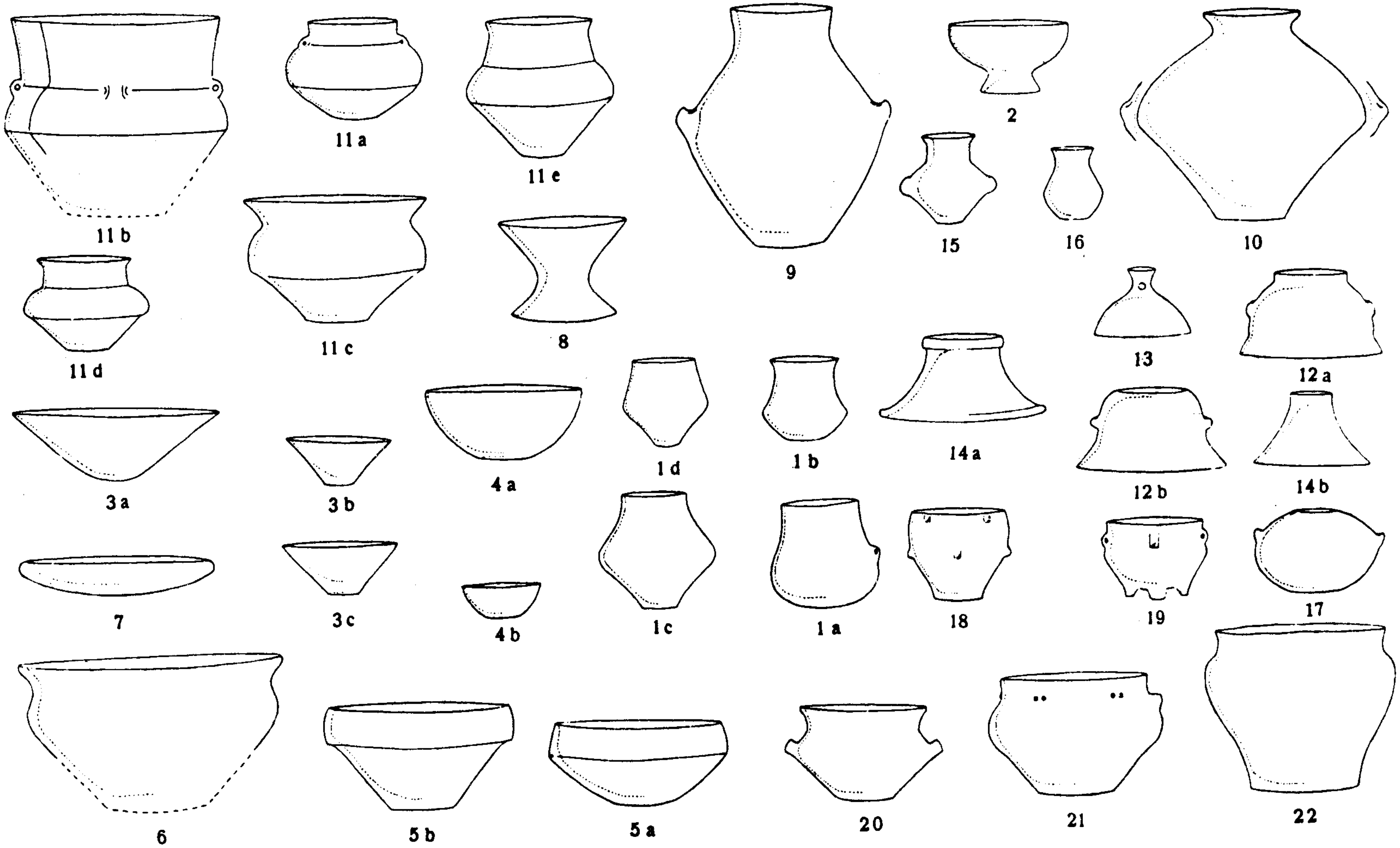


Fig. 9 Cucuteni B vessel shapes (nos. 2 and 17 = Cucuteni A) from the eponymous site, Cucuteni.

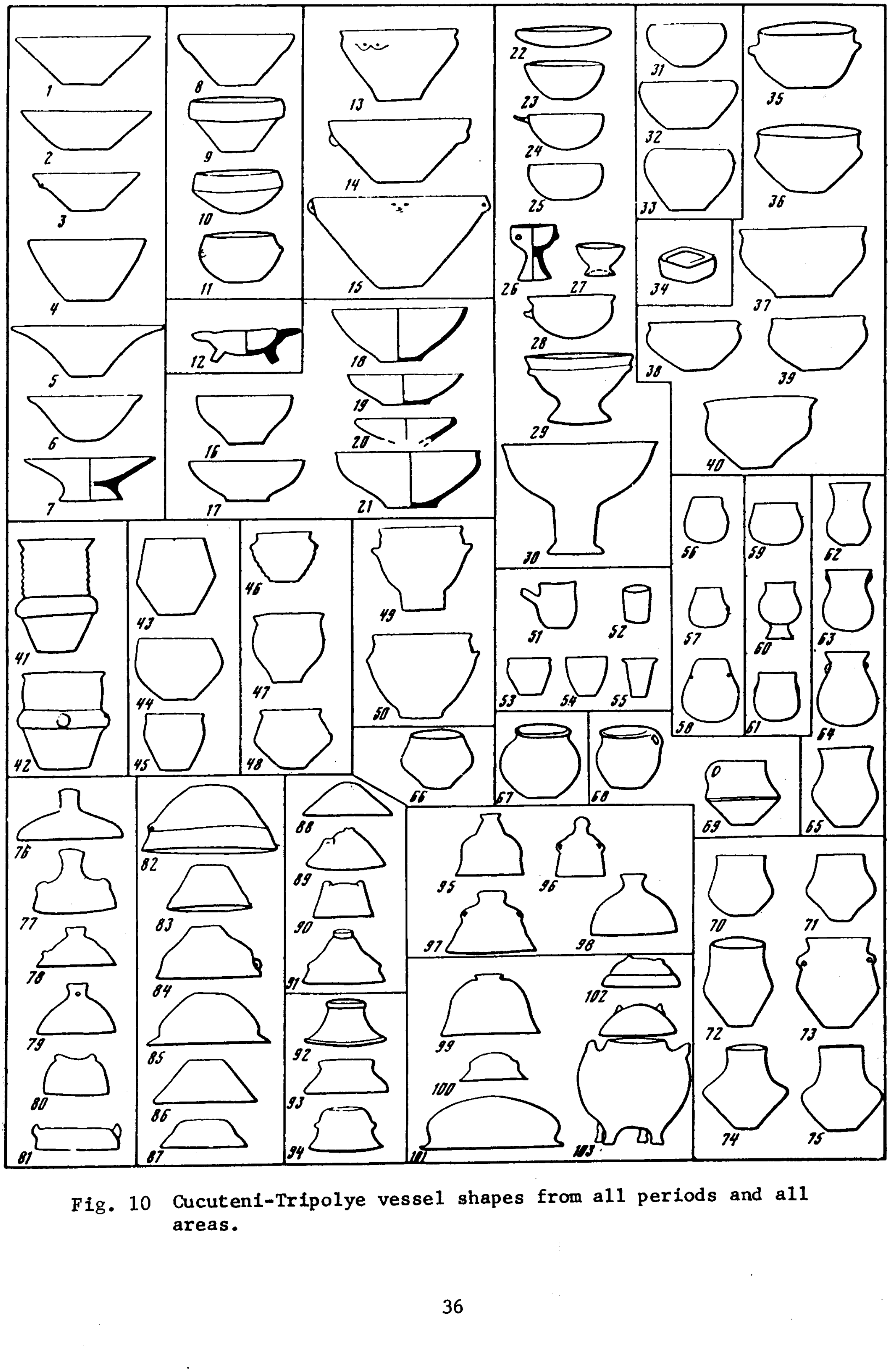


Fig. 10 Cucuteni-Tripolye vessel shapes from all periods and all areas.

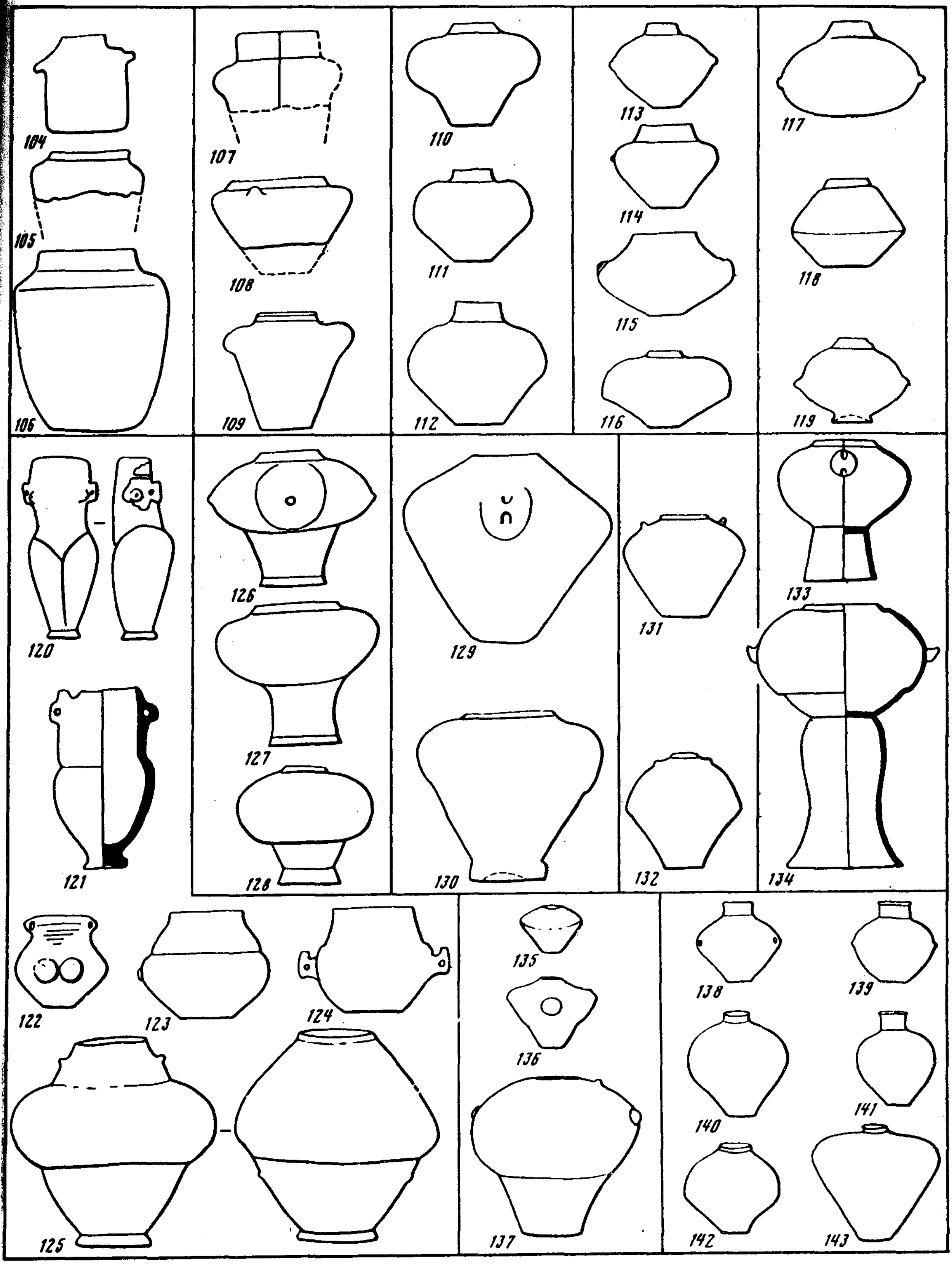


Fig. 10 (continued)

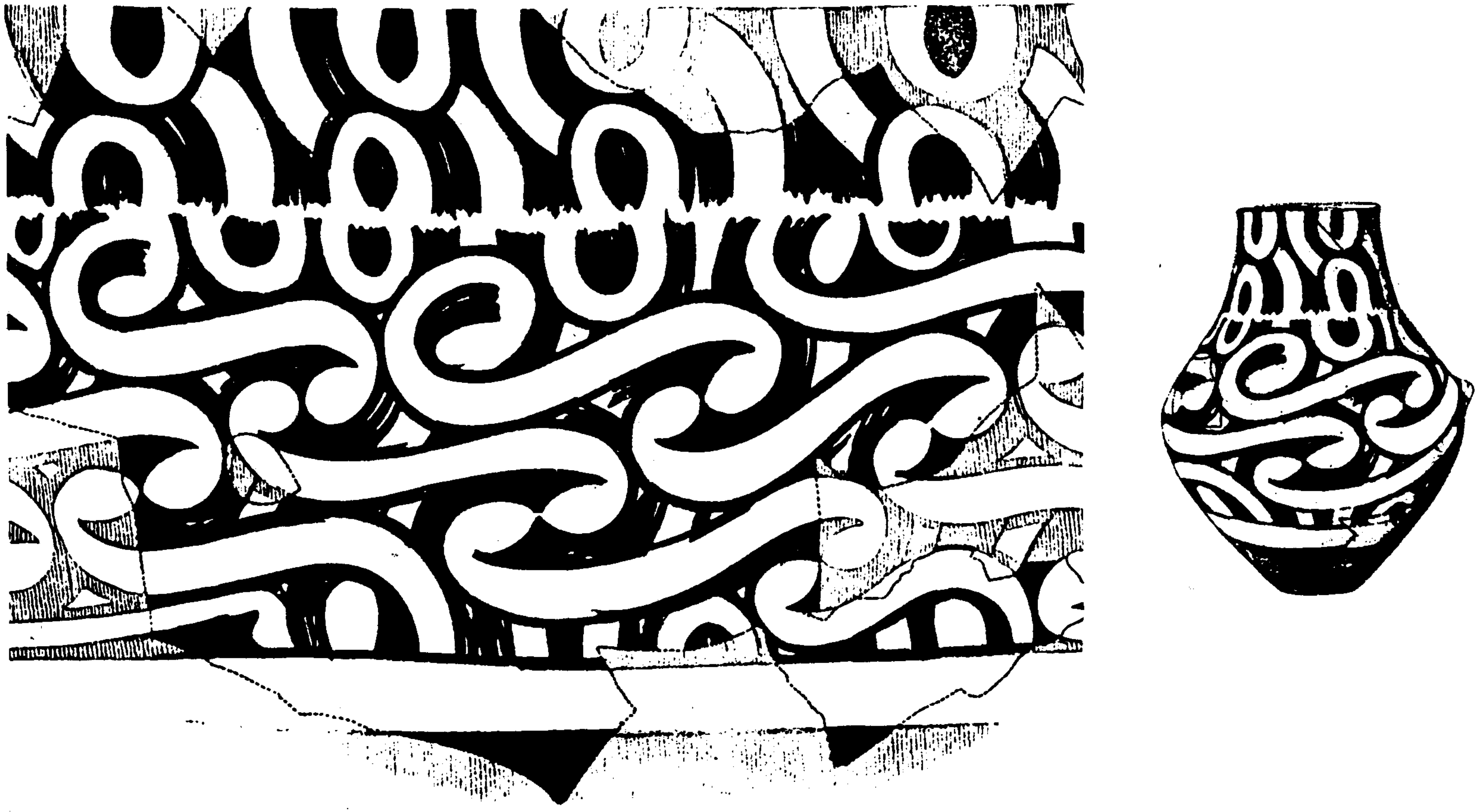


Fig. 11 Cucuteni A trichrome design (vessel: 1/6 natural size).

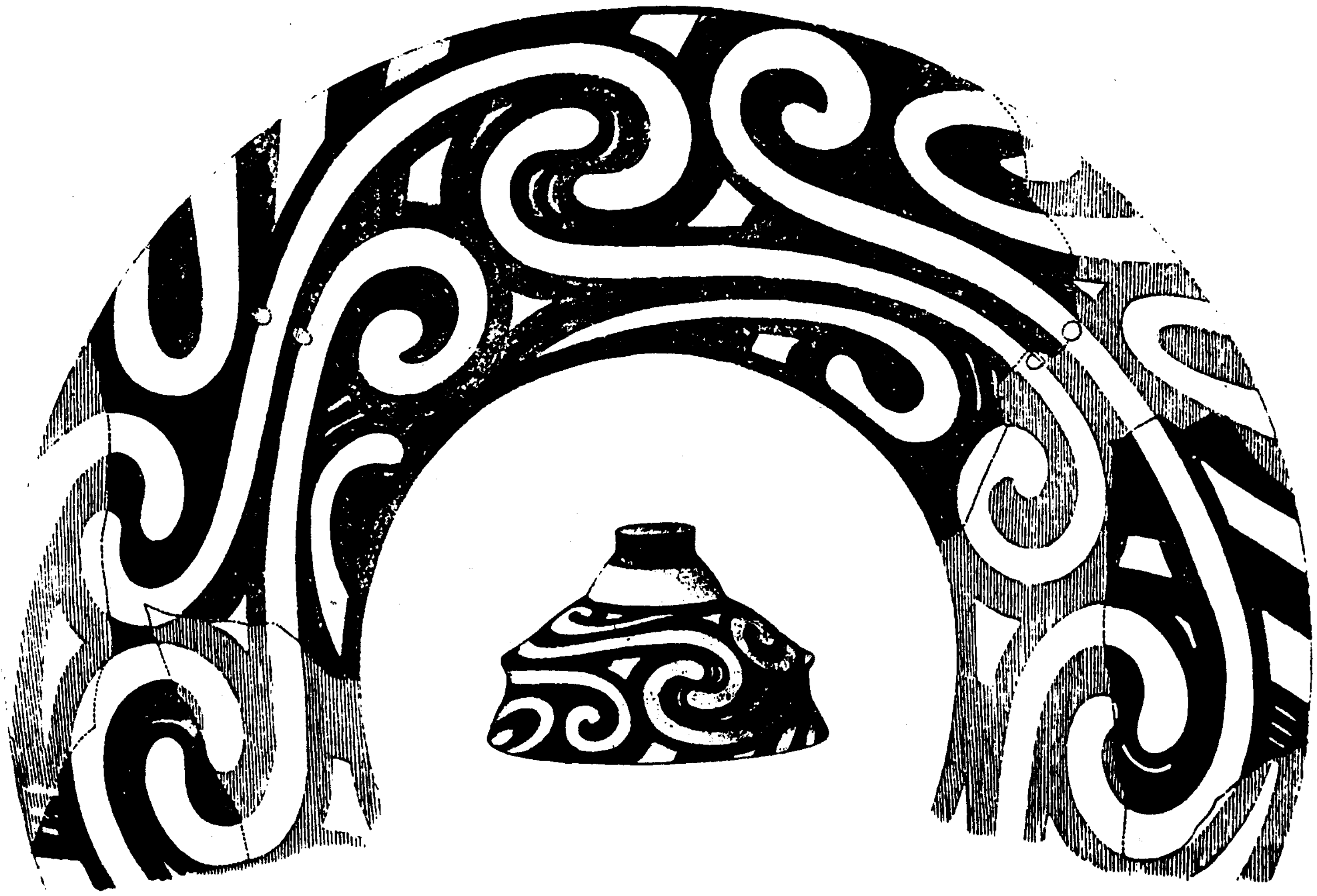


Fig. 12 Cucuteni A trichrome design (lid: ¼ natural size).

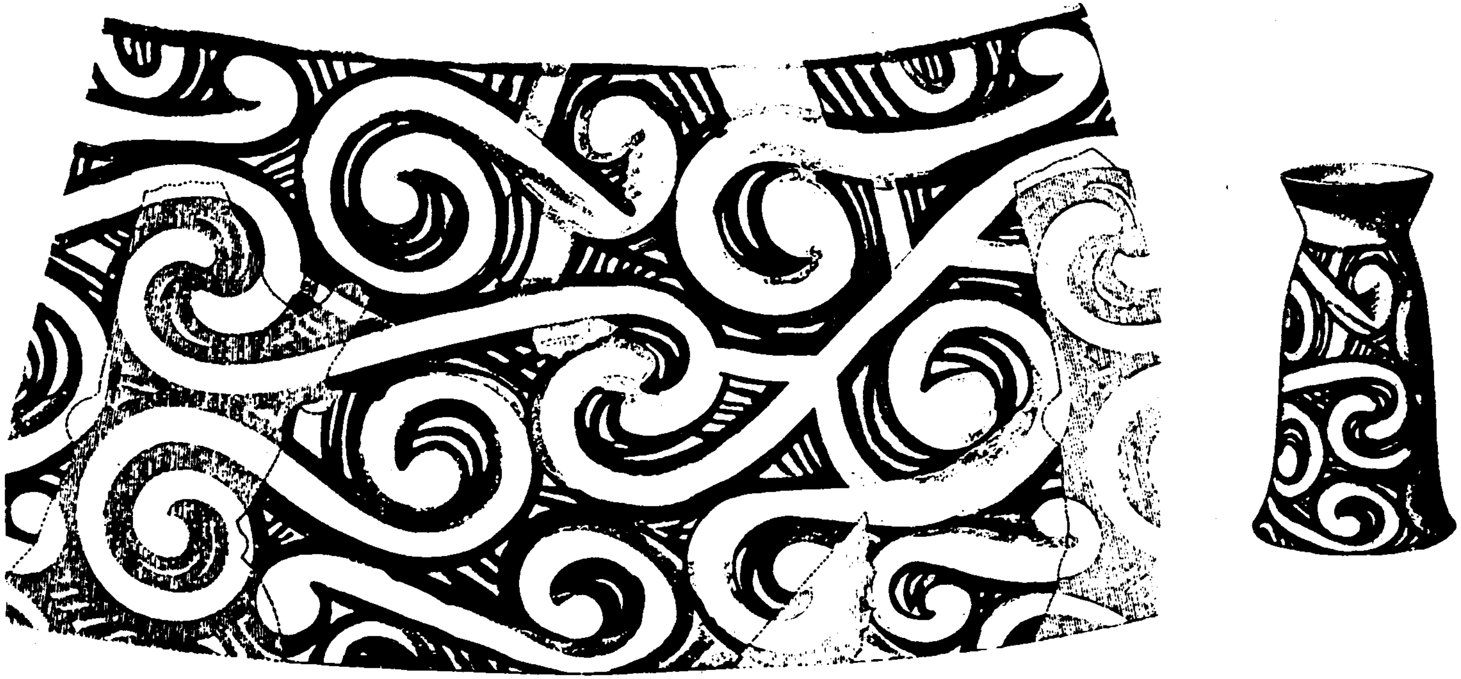


Fig. 13  Cucuteni A trichrome design (vessel stand: 1/6 natural size).

anthropomorphic motifs (figs. 27-30) (5).

In his 1932 monograph, H. Schmidt also designates a "Cucuteni C" ware which, technologically speaking, was the complete antithesis of the Cucuteni A, AB, and B ceramics. This poorly fired, poorly oxidised or even reduced pottery contained large amounts of crushed shell temper and was decorated by comb incising and cord impressing (Ellis 1980). This "Type C", as it is now called, first appears on Cucuteni sites very late in the "A" period and continues throughout the sequence. The quantity of Type C ceramics is noteworthy: The largest concentrations (relative to the painted ware) are on sites at the easternmost and southernmost peripheries of the Cucuteni-Tripolye culture and thence Type C becomes gradational in quantity when moving towards the west until it becomes rare or even nonexistent as one approaches the Eastern Carpathians. Since the 1950s, East and West European and American scholars are fairly consistent in their opinions that this Type C represents an intrusive element into Balkan settlements by slow movements of populations from the South Russian steppe zone (cf. Gimbutas 1973). T. Passek (1949) has expressed the opinion that this corded ware represents the utilitarian ceramics for the Cucuteni-Tripolye culture. There are several problems with this theory. First, T. Passek did not cite Schmidt's 1932 site report in her monograph of 1949. Secondly, the lack of Type C ware on many Romanian sites precludes their use as kitchen ware; and, finally, an unpainted ware, of the same superior technology as the painted ceramics, also exists on Cucuteni sites and presumably could serve for utilitarian purposes. Also of note is the fact that wood could have been used to manufacture culinary containers thus preventing over-use of ceramic vessel in more mundane uses.

### II.C.3. Tripolye ceramic typology

Rather than dividing the materials into two different groups (i.e. "Pre-Cucuteni" and "Cucuteni"), which was an accident of discovery (see section II.A.), the Tripolye sequence encompasses all wares: Tripolye A--incised ware; Tripolye B--trichrome ware; Tripolye C/γ--monochrome (black) ware (6). The middle ("B") period has been further subdivided by Passek into B I (trichrome ware) and B II (trichrome ware plus the first appearance of monochrome ware). In the final period, there has been some attempt to take into consideration regional variation: Tripolye C designates northern sites of the Dnepr and upper Southern Bug Rivers where trichrome ware predominates over monochrome, and Tripolye γ refers to southern sites of the Dnestr and lower Southern Bug Rivers where monochrome ware predominates (7).

The Tripolye C/γ period has been further subdivided by Passek diachronically as follows: Tripolye C I/γ I and Tripolye C II/γ II. The latter variants, C II and γ II, have been the object of controversy. During the final phase, the "Type C" ware (vide supra) deriving from the South Russian steppes forms almost the entire ceramic inventory at these sites with the surviving monochrome ware comprising barely 10%, indicating that the latest "Cucuteni-Tripolye" sites were inhabited by steppe populations whose occupancy formed the bridge between the Chalcolithic and Bronze Age (V. Dumitrescu 1963b). This has prompted scholars such a V. Dumitrescu to question seriously whether we should consider Passek's "C II/γ II" phase as actually belonging to the

Cucuteni-Tripolye culture. In the Romanian relative chronology, Tripolye C II/γ II is designated as "Horodiştea-Folteşti", and by some Soviet scholars as "Gorodsk-Usatovo" in order to signify a different population, together with their bronze weapons, and the beginning of the Bronze Age.

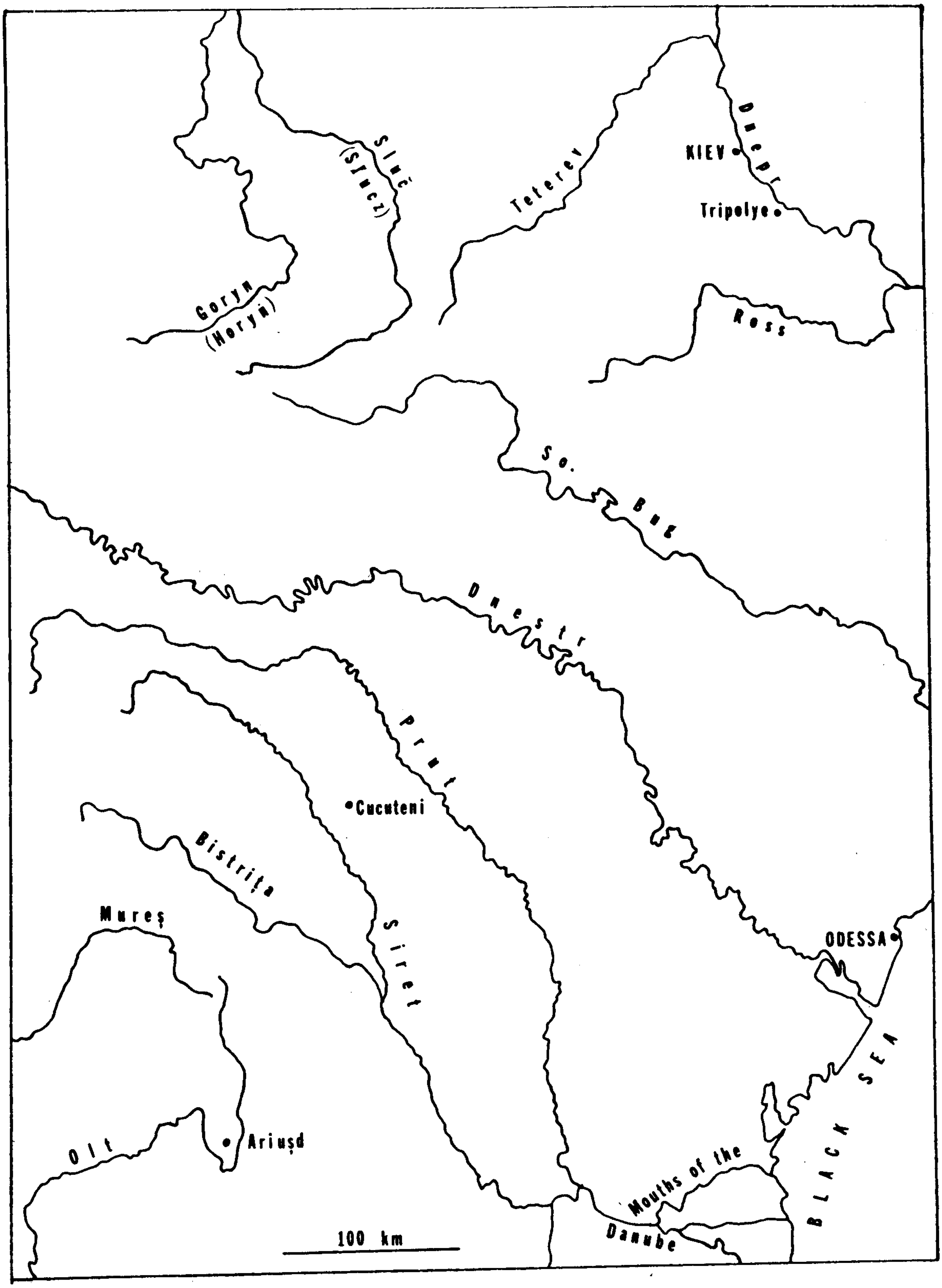
Although the Tripolye sequence appears, on the surface, a less cumbersome terminology to use than that of the Cucuteni sequence, it is deceptively simple. The chronological sequence for painted ware in the Moldavian SSR and the Ukraine is not as readily discernible from ceramic inventories as was Cucuteni A, AB, and B which was determined from multi-level sites. Two reasons exist for this lack of clarity: Throughout the existence of the Cucuteni-Tripolye culture, the splintering of settlements and expansion of populations was a continuous process such that one has to contend with great distances and a massive area of settlement which has not been equally surveyed. Secondly, older traditions in ceramic manufacturing do not give way to new developments, resulting in as many as three types of pottery (i.e. incised, trichrome and monochrome) occurring on a single settlement and even in a single dwelling (e.g. Vladimirovka and Kolomijščina II).

Soviet scholars have been more conservative with their relative chronology such that, despite suggestions in revising the periods, very few changes have actually been made since T. Passek's periodisation of 1949 (cf. Movša 1972; Černyš 1981). However, regional variation has always been recognised as an important factor. Ceramic "types" have therefore been defined and are based on the inventory from clusters of sites in a specific region. The result of this work on regional variation has produced five monographs on Tripolye C I/γ I and C II/γ II (=Cucuteni B and Horodiştea-Folteşti, respectively): the middle Dnepr region (Kruts 1977), the northern Black Sea (Zbenovič 1974), the northern Moldavian SSR (Markevič 1981), the Vykhvatintsy burial ground (Dergačev 1978), and a statistical study on all types of artifacts for Late Tripolye in general (Dergačev 1980).

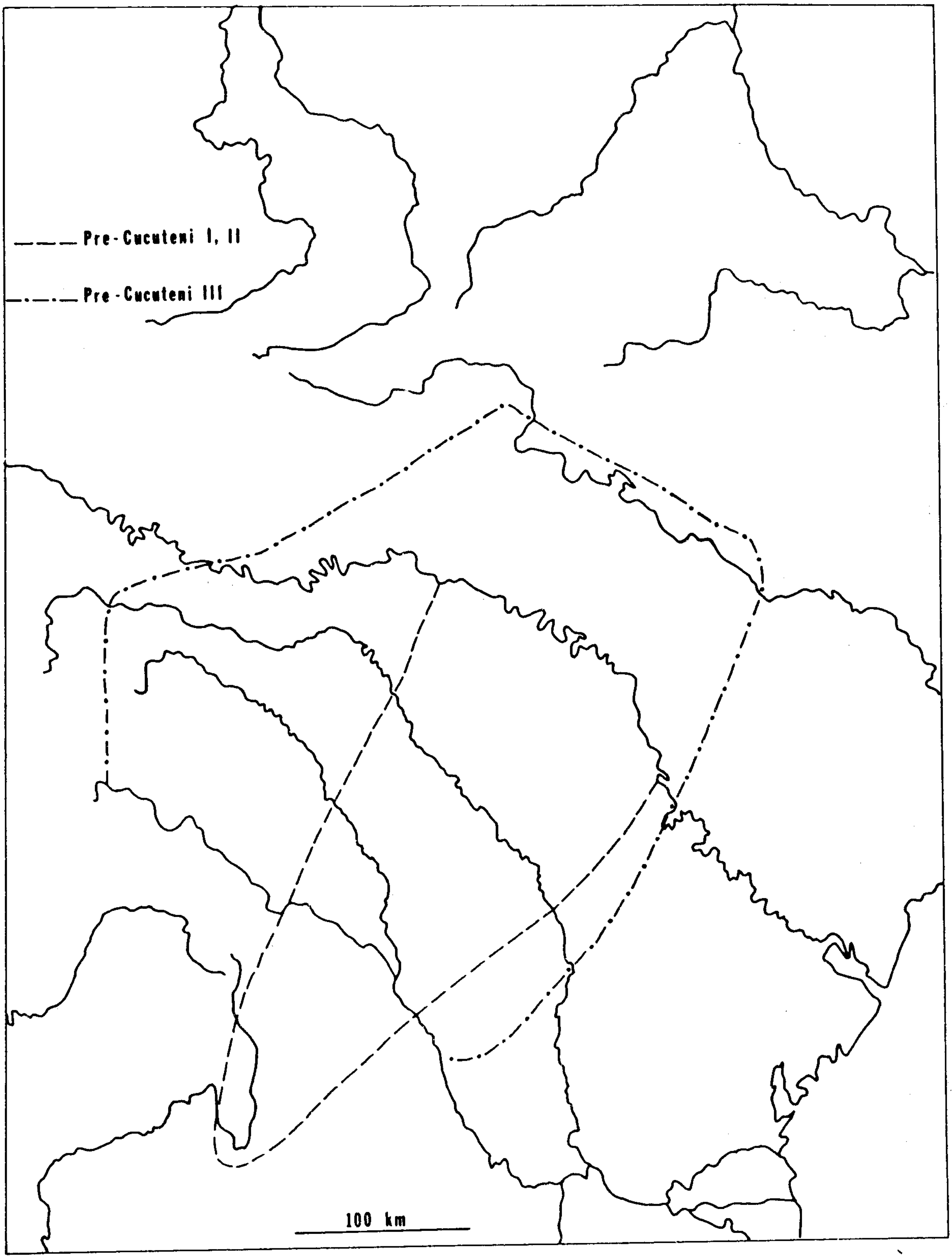
Although this research has organised the materials in a coherent manner, very large geographical gaps still exist; and the early and middle periods (Tripolye A, B I, B II) have not received the same attention as has the latest period so that for site reports of complete excavations we have only journal articles, one monograph for a Tripolye A site (Bibikov 1953), and for Tripolye B--T. Passek's two anthologies of her excavations which cover all periods (Passek 1949; 1961). In addition, the works of Kruts, Zbenovič and Dergačev all concentrate on the C II/γ II phase which is the beginning of the Early Bronze Age and therefore are of peripheral interest here (fig. 31).

### II.C.4. Conclusion on ceramic typology

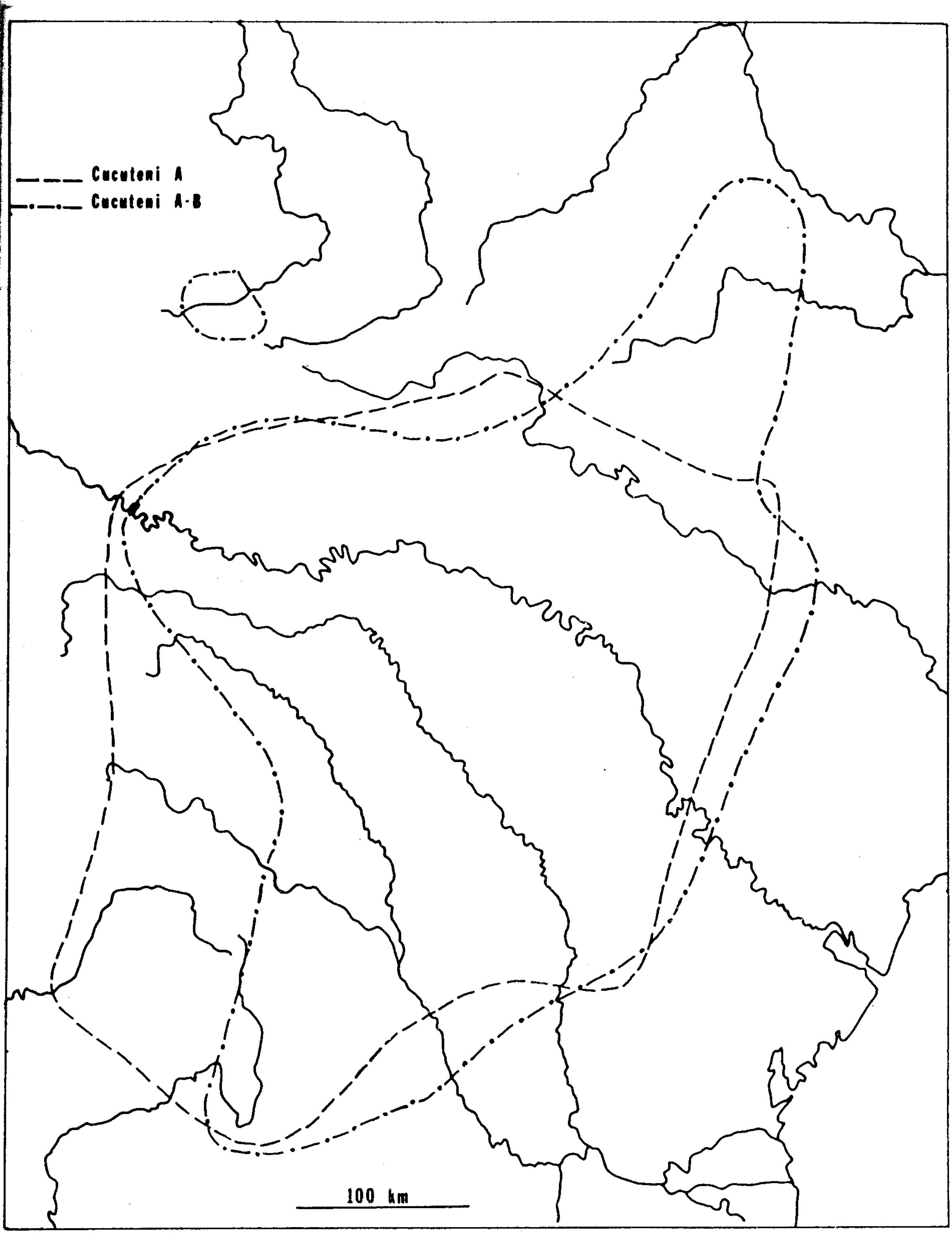
The systems of relative chronology and ceramic typology have been scrutinised in detail and it is suggested here that both the original Cucuteni and Tripolye relative chronologies be preserved--but without any further diachronic subdivisions. The main source of problems is the underlying assumption, made by most archaeologists, that each new ceramic type, or ceramic assemblage, must represent a new period in the evolution of a particular culture without understanding the evolution of technology.



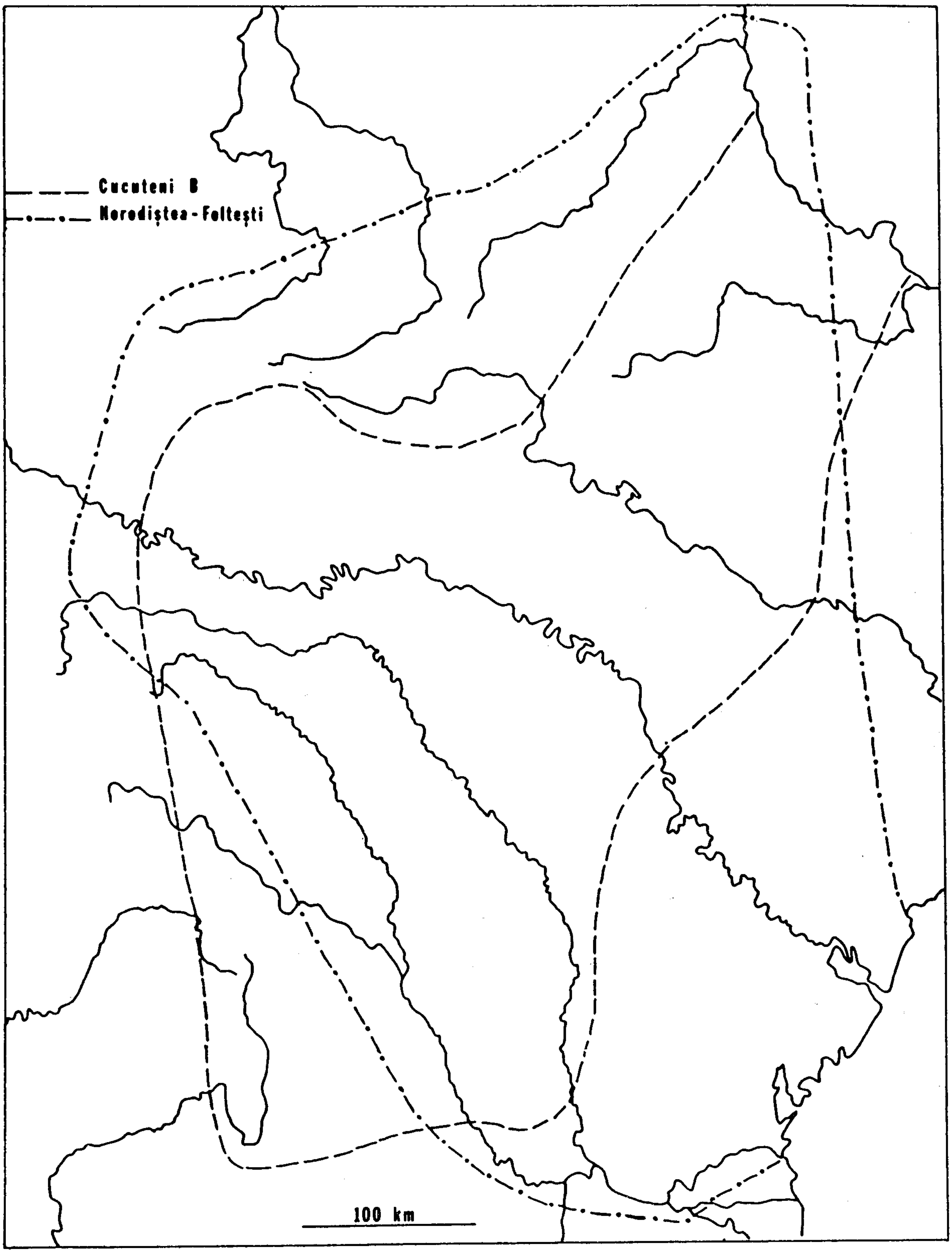
Map 7 Eponymous Sites



Map 8 Pre-Cucuteni/Tripolye A territory



**Map 9 Cucuteni A and AB / Tripolye B I and B II territory**



Map 10 Cucuteni B and Horodiştea-Folteşti / Tripolye C I and C II territory

As was discussed in note (3), entire phases are completely lacking along some major river systems. One chronological phase was defined before it was even found ("Cucuteni A1") and never was found; a phase has even been suggested as a challenge for future scholars, "Cucuteni A5" (V. Dumitrescu 1963a). Instead, particular types of ceramic assemblages should be referred to simply as Cucuteni A, AB, and B, or Tripolye A, B, and C, together with some designation, preferably geographic indicating to which ceramic assemblage reference is being made.

Nevertheless, out of the discussion on synchronic variation (3) (4), several issues should be discussed concerning the nature of ceramic production and the adoption and diffusion of ideas.

From the information on ceramic typology presented here, population movement and information flow can be followed during the Pre-Cucuteni/Tripolye A, Cucuteni A/Tripolye B I, and Cucuteni B/Tripolye C I periods. The expansion of Late Neolithic populations into new agricultural territories east of the Carpathians can be identified by the establishment of settlements with Pre-Cucuteni III (=Tripolye A) pottery. However, once settlement of a core territory (southeastern Transilvania to the Prut River) was effected, the succeeding period, Cucuteni A (=Tripolye B I), could be characterised more by a movement or diffusion of technological ideas, in a down-the-line fashion, initiated by culture contact between the Pre-Cucuteni and Petreşti cultures in the Transilvanian basin and thence continuing eastwards. Although during Cucuteni A (=Tripolye B I), settlements were moved to more protected locations (vide infra) and new lands were being exploited along the Dnestr and Southern Bug Rivers. However, the elaborate styles of Cucuteni AB pottery were not adopted much beyond the Prut River, but during the succeeding Cucuteni B (=Tripolye C I) period the idea and simplicity of the monochrome styles were accepted into the technological repertoire over the entire territory as far as the Dnepr. Considering the relative uniformity of monochrome pottery, with allowances for regional variations, it is suggested here that the spread of ideas through inter-settlement communication was quite rapid.

Together with rapid communication and flow of ideas is the concomitant regionalism. This diversity in ceramic decoration is apparent from the earliest appearance of painted ware (e.g. southeast Transilvania, sub-Carpathians, Siret-Prut interfluve). In connection with this phenomenon is the appearance of clusters of pottery kilns at Cucuteni-Tripolye settlements (chapter III). These kilns, as many as 18 at a single site, suggest, at the very least, that craft specialisation existed at these settlements and that they may also have served the surrounding region as well, thus enhancing synchronic and geographic variation in ceramic decoration.

Another issue that has been raised in open discussion is the question, why did the art style change so radically twice during the painted ware sequence? It is time consuming to paint a curvilinear or geometric design uniformly over a three-dimensional surface both outside and inside the vessel. The task of executing a design is made easier if space on the vessel surface is partitioned and is even easier if space is divided according to the contours of vessel shape. Hence, we see the rise in the Cucuteni AB period of a dramatic change in vessel decoration. Not only was the planning of a design less time-consuming, but elaboration of the existing repertoire of motifs could now be accomplished and H. Schmidt's style classification was an attempt to follow this exponential rise in artistic endeavour. However, these styles did not survive and, as we have seen, were fairly limited in their area of distribution to the region between the Eastern Carpathians and the Prut River. Although design planning was made less cumbersome, too much time and energy was being placed into the elaboration of the individual motifs. Therefore, it is suggested here that the reduction of surface embellishment was one of a number of mass production methods used by Cucuteni-Tripolye potters to shorten the time involved in making large quantities of ceramics. The ε and ζ styles show a drastic reduction and gradual disappearance of the use of red and white paints and an increase in the amount of vessel surface that is left unpainted as well as a rapid degeneration in the rendition of spiralic ornamentation--and it is this tradition of rendering motifs in "shorthand" by using black and exploiting the various shades of red on the clay surface which is widely adopted across Cucuteni-Tripolye territory (figs. 27-31).

### II.C.5. Absolute dating

More dates are available for the absolute chronology of the painted ware sequence than there exist for the earliest Pre-Cucuteni III/Tripolye A period (table 1). The Cucuteni A/Tripolye B I period has eight radiocarbon dates which range 3675-3150 b.c., Cucuteni B/Tripolye C I has two dates: 3000 b.c. and 2920 b.c., and for the transitional period to the Early Bronze Age (i.e. Tripolye C II/γ II) four dates are available between 2840 and 2390 b.c.

A final note of caution on the chronology is needed: In attempting to synchronise the two relative chronologies, and in assigning absolute dates, not all Cucuteni phases are exactly equivalent to the Tripolye phases in time. Figure 6 gives only approximate guidelines. Population growth and expansion have not yet been taken into consideration (maps 7-10 show the increase in area of occupation through time). Changes in the ceramic tradition do not occur uniformly: Innovations in surface decoration appear to have been made first in the western areas and gradually "moved" eastwards along with the populations who developed these traditions. The effect on the relative chronologies can be exemplified by the following: Tripolye A in the Ukraine (equivalent in style with Pre-Cucuteni III) is actually synchronous in time with early Cucuteni A in Romania. Likewise, Tripolye B I polychrome ware (equivalent in style with Cucuteni A) does not reach the Ukraine until the Cucuteni AB period in Romania.

### II.C.6. Settlement location and building construction

The erratic choice of settlement location during the early period (Pre-Cucuteni/Tripolye A) changed to a more consistent selection of naturally fortified locations during the painted pottery sequence. The preponderance of sites along major river systems (e.g. Siret, Prut, Dnestr, Southern Bug, Dnepr) reinforces this supposition. In general, settlements are located on high river terraces, on edges of river canyons, on slopes of valleys which are sometimes quite steep (30°-60°

gradient), on natural "acropolis" formations, and other positions with limited accessibility (Markevič 1981:70-72).

Even though settlements were located in relative security, the inhabitants evidently still felt the need to cut off any potential access to the site by defence constructions. These defences consisted of a V-shaped ditch 2-4 m deep and 3-6 m wide followed by a rampart or earthen embankment approximately 1 m in preserved height and as much as 6 m in width. The settlements of Cucuteni and Kostešty IV (Costeşti) may serve as two examples of fortified sites: Kostešty IV in the Moldavian SSR comprised 25 dwellings located on a steep slope of a cliff and had a fortifications system of three parallel ditches and accompanying ramparts (Markevič 1981:72). The eponymous site of Cucuteni-Cetăţuia (from: 'cetate' or fortress) was located on an acropolis; although the settlement edge had suffered some erosion through time, it was clearly determined that at least two ditch/rampart constructions existed, in which the walls and edges of the ditches and the ramparts had been reinforced by stone slabs and stone packing (Schmidt 1911; 1932:Beilage 2).

Dwellings were constructed on carefully prepared platforms in the same tradition as in Pre-Cucuteni III/Tripolye A. During the Cucuteni B (=Tripolye C I) period, there is a predilection towards the construction of 2-4 family longhouses (fig. 15).

The construction of two-storey buildings also began during the Late Tripolye period in the Moldavian and Ukrainian SSRs. Among the several clay models of Tripolye houses which have been found is a model of a two-storey dwelling found at Novye Rusešty (Ruseştii Noi) (Markevič 1981:fig. 46/1) and a model from Rassokhovatka (reproduced here, fig. 16). Besides these house models, there is evidence from numerous sites (e.g. Petreny, Majdanets'ke, Varvarovka VIII, Varvarovka XV, Brynzeny III) (fig. 17).

Based on both archaeological evidence and ethnographic analogy, Markevič (1981:83) details the construction of two-storey buildings as follows: The foundation and walls were prepared as described in section II.B.2. The walls, however, when plastered with a clay and chaff admixture reached a thickness of 30 cm. Split beams, placed curved side up, were then positioned crosswise on the longitudinal walls over which was spread a 5-12 cm layer of clay with chaff. A second 1-2 cm layer of clay was used as facing. The walls of the second storey were then constructed but were considerably shorter. The double-gabled roof was then built as previously mentioned (section II.B.2).

The proof of the existence of two-storey buildings has been carefully outlined by Markevič (1981:81). From excavations, these collapsed buildings appear as "double" floors with the thinner, collapsed roof on top. However, the question arises, how does one distinguish a collapsed two-storey building from a house foundation that has been used a second time by having a new platform prepared on top of the previous one? First of all, when a house foundation has to be reused, the old surface is smoothed down considerably, i.e. loose clay is removed; any raised platforms and clay ovens are destroyed; and debris is removed. However, on what would be the first floor of a two-storey construction, none of the above preparations were made and huge

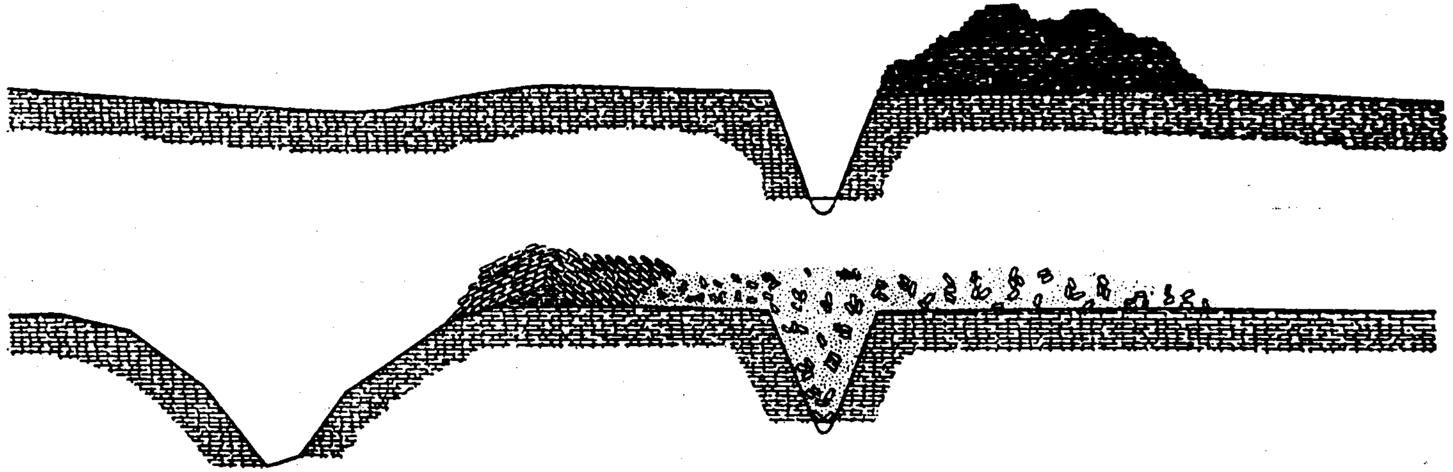


Fig. 14 Ditch/rampart constructions at the site of Cucuteni during the Cucuteni A period (upper) and Cucuteni B period (lower).

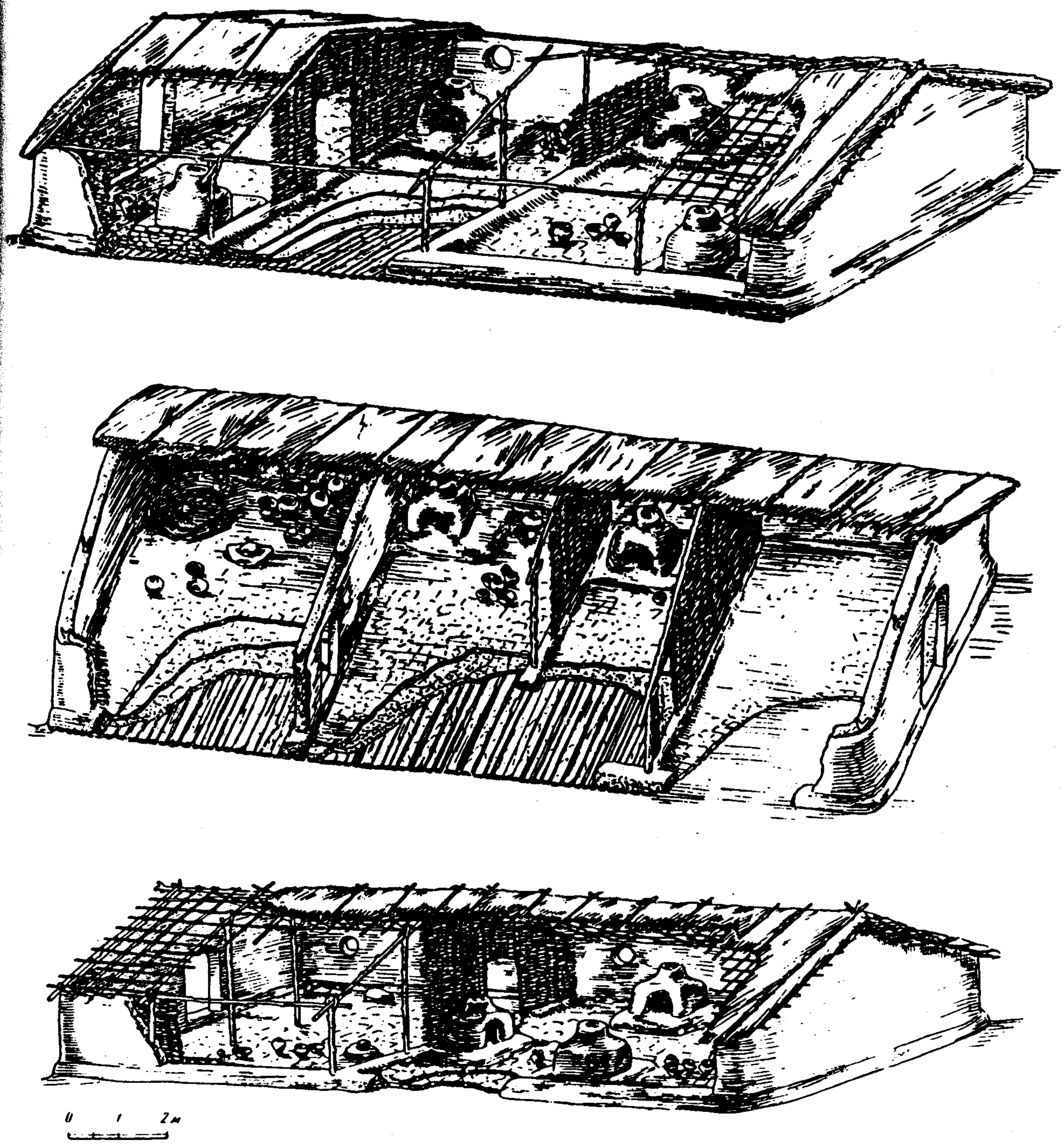


Fig. 15 Long-house construction at Kolomijščina I; dwellings 24 (upper), 11 (middle), and 2 (lower).

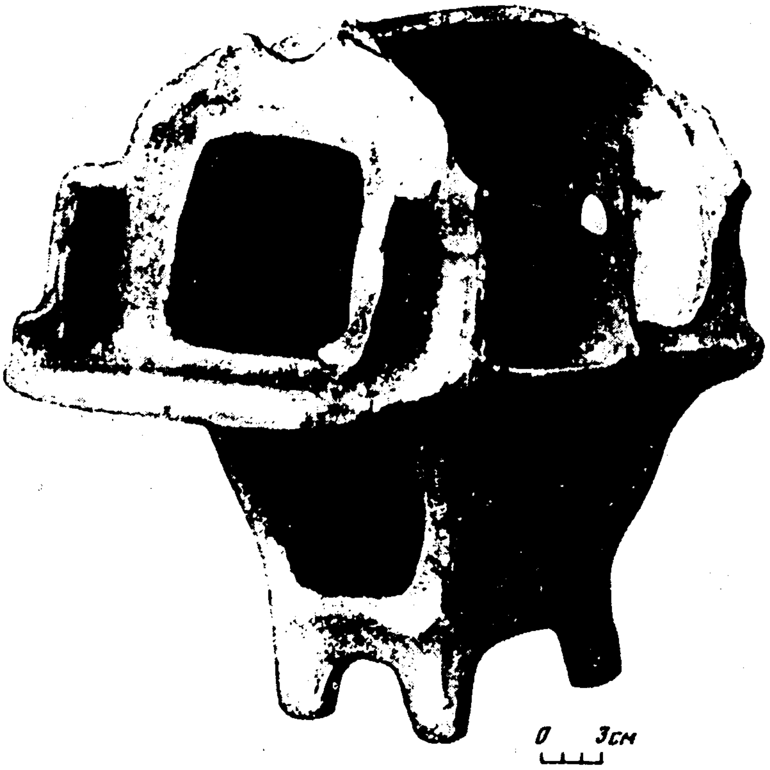


Fig. 16 Clay model of a two-storey dwelling found at Rassokhovatka.

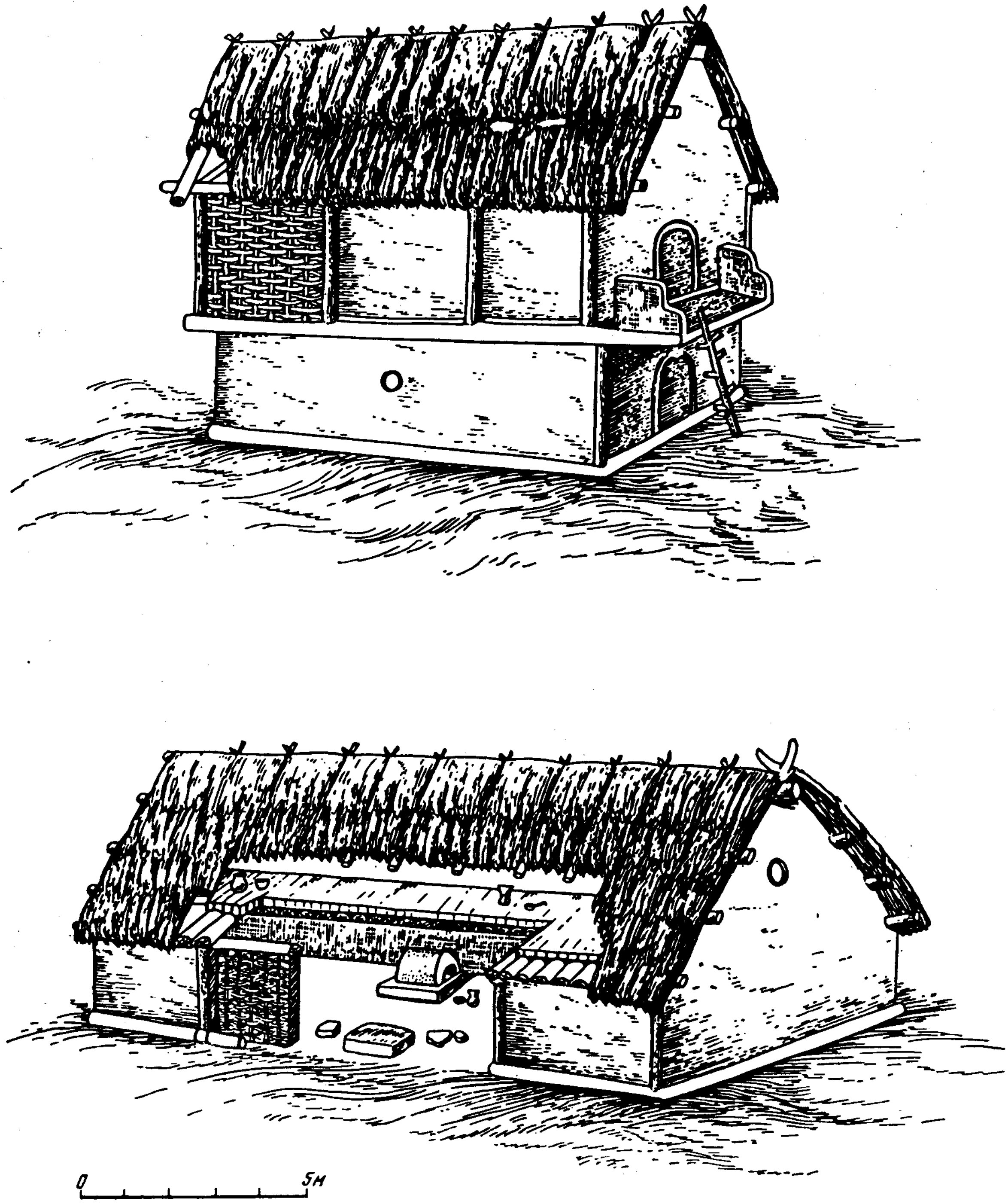


Fig. 17 Reconstructions of two-storey dwellings excavated at Rakovets (upper) and Lenkovtsy (lower).

accumulations of clay from platforms and ovens are still present. Secondly, after fire, house collapse, or other reason for desertion, all usable objects would be removed for further use, especially if a new foundation was going to be built on the old one. However, in these two-storey structures, on the first floor can be found whole vessels, grinding stones, loom weights, stone tools, etc., although they were still quite useful. Thirdly, the floor of the second level was almost always constructed differently than the first floor: For instance, at the site of Brynzeny III (Brânzeni), in dwellings no. 24 and 25 the second-storey floor had a "trap door"--a clearly demarcated recess (presumably originally of wood) in the upper floor for access purposes. This type of construction has never been found in remains of single-storey buildings. And finally, the second-storey floor usually reveals some remains of mortise-and-tenon construction in the form of large clay bricks with clear sockets (Markevič 1981).

The occurrence, location, size, and function of these two-storey buildings, however, vary considerably and will receive additional discussion in the following chapters.

### II.C.7. Economy

During Cucuteni A/Tripolye B I and Cucuteni B/Tripolye C I, at least two kinds of wheat, Triticum compactum and T. vulgare, have been identified at the Romanian sites of Bodeşti, Hăbăşeşti and Valea Lupului (Comşa 1981). Rye (Secale cereale) was found at Carasa-Miclăuşeni dating to the Cucuteni AB period (Comşa 1981). Table 4 summarises the results of archaeobotanical analyses for six sites in Soviet Moldavia for the latest periods of Cucuteni-Tripolye. For this time period, four species of wheat, as well as barley and millet have been identified as the domestic grain crops, along with peas, grapes, apricots, and plums (JAnuševič 1976; Markevič 1981:136).

The faunal data from Cucuteni A and AB (=Tripolye B) sites indicate a continuing reliance on cattle among the domestic species, except at Khalep'e and Polivanov JAr where sheep/goat and pig, respectively, predominate. At all sites, except Berezovskaja, wild species are subordinate to domesticants, and red deer continues to be the favored animal of the hunt. These general conclusions are also valid for the last phase of the Cucuteni-Tripolye culture, except that increasing numbers of horse can be detected. Equus przewalski and E. caballus have been combined in the tables, since the authors from whom the data were taken listed them together or separately or were unsure as to the wild vs. domestic status. In fact, many of the individuals listed under late Cucuteni-Tripolye have been identified as domesticated (tables 3a and 3b).

### II.C.8. Culture contact and technological change

Although the continuity between the early Pre-Cucuteni/Tripolye A period and the succeeding Cucuteni A/Tripolye B I period has been established by the excavation of multi-level sites and has been accepted for 50 years, this continuity does not explain the sudden changes in ceramic manufacturing that occurred between these two periods. Wherefrom did the idea of pre-fire painting derive?

During all phases of Pre-Cucuteni, incising and excising were the standard techniques of surface decoration. The use of white incrustation to fill spaces produced by excising, as well as the application of red ochre--both post-firing decorative techniques--is documented during Pre-Cucuteni II (Marinescu-Bîlcu 1974:67-68), but the use of a clay-water based slip applied before firing is not attested until Pre-Cucuteni III (Marinescu-Bîlcu 1974:75, 77). For instance, during the 1961 and 1962 excavations at Tîrpeşti, Pre-Cucuteni sherds were found with a red slip on the exterior and with a thick, matte white slip on the interior surface (V. Dumitrescu 1963a:61, note 3). This appearance of a slip during Pre-Cucuteni III proves at least that some elements of the painted ware tradition started to appear.

Nevertheless, not only are there differences in technology but also differences in the way in which these post-fire paints are employed: The red ochre is never used for decorative motifs but for painting remaining spaces between incised motifs, as opposed to the later depiction of motifs by bands of red slip. There is also a significant departure from the use of white incrustation to fill in incised lines during Pre-Cucuteni to the painting of motifs in a white, pre-fire slip on the later trichrome ware.

The origins of pre-fire, trichrome painting have been traced to early contacts between Pre-Cucuteni and cultures who were familiar with painting to the south and west.

Contemporaneous with the Pre-Cucuteni III phase in eastern Romania and situated to the south, developed the Gumelniţa culture (map 5; fig. 1). The northeastern part of the Gumelniţa culture area formed a contact zone with the southernmost elements of Pre-Cucuteni III and early Cucuteni A, which gave rise to an amalgamation known as "Stoicani-Aldeni". Ninety sites are now known for this mixed group, located in southeastern Romania, southern Soviet Moldavia, and the southwestern corner of the Ukraine (Dragomir 1979).

The potters of the Gumelniţa culture applied graphite for decoration before firing--a technique inherited from their Boian culture predecessors. However, the application of a pre-fire white slip, although infrequent, was developed by Gumelniţa potters and was often found on Stoicani-Aldeni ceramics and could have contributed to the appearance of white slip painting on Cucuteni-Tripolye ceramics--all the more so since the beginning of Gumelniţa is contemporaneous with Pre-Cucuteni III (V. Dumitrescu 1963a:62).

In this contact zone, one of the more interesting features is the appearance of bichrome (white on red) ware. As mentioned earlier, bichrome ware does make a brief appearance during the Cucuteni A period but has not been identified in all parts of the Cucuteni territory rather only in a zone relatively southwest where Pre-Cucuteni III had contact with the Gumelniţa culture (Dragomir 1979; Dumitrescu 1963a).

Determining the origins of technological ideas is not an easy task: On Stoicani-Aldeni and Cucuteni A bichrome wares, the white spiralic bands painted on a red background are bordered by incised

Table 3a. Archaeozoological data from Cucuteni AB and Tripolye B sites.

| | Traian-Dealul Fîntînilor* | | Sabatinovka I** | | Berezovskaja** | | Solončeny II** | |
|---|---|---|---|---|---|---|---|---|
| | No. of individuals | % of total | No. | % | No. | % | No. | % |
| Cattle (*Bos taurus*) | 9 | 31.0 | 30 | 25.6 | 12 | 16.7 | 39 | 24.7 |
| Sheep-goat (Ovicaprinae) | 4 | 13.8 | 14 | 12.0 | 6 | 8.3 | 14 | 8.9 |
| Pig (*Sus scrofa domesticus*) | 3 | 10.3 | 14 | 12.0 | 6 | 8.3 | 26 | 16.5 |
| Dog (*Canis familiaris*) | - | ---- | 14 | 12.0 | 2 | 2.8 | 7 | 4.4 |
| Total DOMESTIC Animals | 16 | 55.1 | 72 | 61.6 | 26 | 36.1 | 86 | 54.4 |
| Horse (*Equus przewalski* and/or *E. caballus*) | 1 | 3.5 | 9 | 7.7 | 3 | 4.2 | 6 | 3.8 |
| Red deer (*Cervus elaphus*) | 7 | 24.1 | 10 | 8.5 | 20 | 27.8 | 34 | 21.5 |
| Roe deer (*Capreolus capreolus*) | 2 | 6.9 | 4 | 3.4 | 3 | 4.2 | 7 | 4.4 |
| Wild pig (*Sus scrofa ferus*) | 2 | 6.9 | 8 | 6.8 | 8 | 11.1 | 20 | 12.7 |
| Other wild animals | 1 | 3.5 | 14 | 12.0 | 12 | 16.7 | 5 | 3.2 |
| Total WILD Animals | 12 | 45.0 | 45 | 38.4 | 46 | 63.9 | 72 | 45.6 |

Table 3a (continued)

| | Khalep'e** | | Kolomijščina II** | | Vladimirovka** | | Polivanov JAr** | |
|---|---|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % | No. | % |
| Cattle (*Bos taurus*) | 11 | 23.9 | 8 | 32.0 | 36 | 30.0 | 33 | 13.0 |
| Sheep-goat (Ovicaprinae) | 17 | 37.0 | 5 | 20.0 | 30 | 25.0 | 39 | 15.4 |
| Pig (*Sus scrofa domesticus*) | 8 | 17.4 | 3 | 12.0 | 25 | 20.8 | 92 | 36.4 |
| Dog (*Canis familiaris*) | 1 | 2.2 | 3 | 12.0 | 2 | 1.7 | 9 | 3.6 |
| Total DOMESTIC Animals | 37 | 80.5 | 19 | 76.0 | 93 | 77.5 | 173 | 68.4 |
| Horse (*Equus przewalski* and/or *E. caballus*) | 2 | 4.3 | 2 | 8.0 | 5 | 4.2 | 3 | 1.2 |
| Red deer (*Cervus elaphus*) | 2 | 4.3 | 1 | 4.0 | 11 | 9.2 | 24 | 9.5 |
| Roe deer (*Capreolus capreolus*) | -- | ---- | -- | ---- | 3 | 2.5 | 14 | 5.5 |
| Wild pig (*Sus scrofa ferus*) | 1 | 2.2 | 2 | 8.0 | 1 | 0.8 | 16 | 6.3 |
| Other wild animals | 4 | 8.7 | 1 | 4.0 | 7 | 5.8 | 23 | 9.1 |
| Total WILD Animals | 9 | 19.5 | 6 | 24.0 | 27 | 22.5 | 80 | 31.6 |

* Necrasov and Haimovici 1962 ** Tsalkin 1970

Table 3b. Archaeozoological data from Tripolye C (=Cucuteni B) sites.

| | Skandraki* | | Stena* | | Trojanov* | | Pavoloch'* | | Podgortsy* | |
|---|---|---|---|---|---|---|---|---|---|---|
| | No. of indiv. | % of total | No. | % | No. | % | No. | % | No. | % |
| Cattle (Bos taurus) | 4 | 10.5 | 13 | 17.1 | 13 | 24.1 | 6 | 20.7 | 12 | 36.4 |
| Sheep-goat (Ovicaprinae) | 5 | 13.2 | 9 | 11.8 | 7 | 13.0 | 6 | 20.7 | 2 | 6.1 |
| Pig (Sus scrofa domesticus) | 3 | 7.9 | 14 | 18.4 | 6 | 11.1 | 3 | 10.3 | 2 | 6.1 |
| Dog (Canis familiaris) | 3 | 7.9 | 3 | 3.9 | 3 | 5.6 | 1 | 3.4 | 1 | 3.0 |
| Total DOMESTIC Animals | 15 | 39.5 | 39 | 51.3 | 29 | 53.7 | 16 | 55.2 | 17 | 51.5 |
| Horse (Equus przewalski and/or E. caballus) | 3 | 7.9 | 9 | 11.8 | 5 | 9.3 | 1 | 3.4 | 2 | 6.1 |
| Red deer (Cervus elaphus) | 3 | 7.9 | 6 | 7.9 | 4 | 7.4 | 3 | 10.3 | 5 | 15.2 |
| Roe deer (Capreolus capreolus) | 3 | 7.9 | 4 | 5.3 | 2 | 3.7 | 1 | 3.4 | 1 | 3.0 |
| Wild pig (Sus scrofa ferus) | 5 | 13.2 | 5 | 6.6 | 4 | 7.4 | 1 | 3.4 | 3 | 9.1 |
| Other wild animals | 9 | 23.7 | 13 | 17.1 | 10 | 18.5 | 7 | 24.1 | 5 | 15.2 |
| Total WILD Animals | 23 | 60.5 | 37 | 48.7 | 25 | 46.3 | 13 | 44.8 | 16 | 48.5 |

Table 3b (continued)

| | Brynzeny IV** | | Brynzeny III** | | Kostešty IV** | |
|---|---|---|---|---|---|---|
| | No. | % | No. | % | No. | % |
| Cattle (*Bos taurus*) | 14 | 28 | 87 | 39.0 | 76 | 21.9 |
| Sheep-goat (Ovicaprinae) | 9 | 18 | 31 | 13.9 | 62 | 17.9 |
| Pig (*Sus scrofa domesticus*) | 7 | 14 | 25 | 11.2 | 29 | 8.4 |
| Dog (*Canis familiaris*) | 2 | 4 | -- | ---- | 5 | 1.4 |
| Total DOMESTIC Animals | 32 | 64 | 143 | 64.1 | 172 | 49.6 |
| Horse (*Equus przewalski* and/or *E. caballus*) | 3 | 6 | 20 | 9 | 13 | 3.7 |
| Red deer (*Cervus elaphus*) | 5 | 10 | 16 | 7.2 | 79 | 22.8 |
| Roe deer (*Capreolus capreolus*) | -- | -- | 5 | 2.2 | 5 | 1.4 |
| Wild pig (*Sus scrofa ferus*) | 2 | 4 | 9 | 4.0 | 18 | 5.2 |
| Other wild animals | 8 | 16 | 30 | 13.5 | 60 | 17.3 |
| Total WILD Animals | 18 | 36 | 80 | 35.9 | 175 | 50.4 |

* Tsalkin 1970 ** Markevič 1981

Table 4 Palaeobotanical finds from Tripolye C sites in the Moldavian SSR (Data from Markevic 1981:136)

| | Brynzeny IV (Brânzeni) | Varvarovka VIII | Varvarovka XV | Brynzeny III | Kostešty IV (Costeşti) | Gordinešty II (Gordineşti) |
|---|---|---|---|---|---|---|
| *Triticum monococcum* | X | X | X | X | X | X |
| *T. dicoccum* | X | X | X | X | X | X |
| *T. spelta* | X | X | X | X | X | X |
| *T. compactum* | X | X | X | X | X | |
| *Hordeum vulgare* | | X | X | X | X | X |
| *Panicum miliaceum* | | X | X | X | | X |
| *Pisum sativum* | | X | X | X | X | |
| *Vitis* sp. | | X | | | | |
| *Prunus armeniaca* | X | X | | | | |
| *Prunus* sp. | | | X | | | |

parallel lines; in this case the white paint has only a secondary role to fill in the space between pairs of incised lines. But spiralic bands, formed by incised parallel lines, are characteristic of both early Gumelniţa designs, as well as Pre-Cucuteni III decoration.

The incised border demarcating the margins of these white bands could be the point of departure for the use of black paint as margins of wide bands in white or red which is characteristic of the later trichrome wares of Cucuteni-Tripolye (V. Dumitrescu 1963a:64).

More conclusive evidence for the origins of trichrome painting lies to the west of the Cucuteni-Tripolye culture area, specifically central Transilvania.

The Petreşti culture is located immediately to the west of the Transilvanian zone of the Cucuteni-Tripolye culture (map 5) and dates before the Cucuteni A period (fig. 1). The development of the Petreşti ceramic tradition is autochthonous, with roots in the preceeding Turdaş culture and developed in the region of the central Mureş River (Paul 1981).

This region has a long tradition of ceramic decoration by means of painting before firing. It is well established that in the Middle-Late Neolithic Turdaş culture vases were painted with wide, red and black bands, representing a direct continuity from the Early Neolithic Criş-Starčevo culture (V. Dumitrescu 1963a:64-65). The Chalcolithic Petreşti ceramics are monochrome (red), bichrome (red and white) and trichrome (red, white, and black) in chronological order, respectively (Paul 1981). Even in the early phase, two types of trichrome styles are found: red and black on a white background and black and white on a red background--the exact analogues of these two styles in Cucuteni-Tripolye have precise origins here in Petreşti ceramic art (V. Dumitrescu 1963a).

Therefore, it is clear that the Petreşti trichrome wares antedate the earliest manifestations of Cucuteni-Tripolye painted pottery, including the brief appearance of Cucuteni-Tripolye bichrome ware.

In addition to painting technology, decorative motifs of Cucuteni-Tripolye ceramics also derive from the Petreşti culture, as well as vessel forms: The cylindrical vessel supports, tall and hollow in the interior and having two holes placed opposite to each other near the top (fig. 7:8a and fig. 8:82, 83), are not found anywhere else in the Carpatho-Danubian region but exist in the Petreşti culture and the vessel support subsequently became a characteristic form among the Cucuteni-Tripolye inventory of shapes.

As mentioned in section II.B.4., early contacts already existed with the Petreşti culture to the west. The evidence on the origins of Cucuteni-Tripolye painted ware in central Transilvania, rather than to the south, is therefore quite convincing.

## Notes to Chapter II

(1) The term 'culture' is used in this work, and in the archaeological works cited herein, in the sense of what has sometimes been called 'archaeological culture', or 'culture area', using the definition introduced by V. G. Childe in The Danube in Prehistory (1929):

> A culture is defined as an assemblage of artefacts that recur repeatedly associated together in dwellings of the same kind and with burials by the same rite. The arbitrary peculiarities of implements, weapons, ornaments, houses, burial rites and ritual objects are assumed to be the concrete expression of common social traditions that bind together the people.

Renfrew (1978b) stands opposed to the use of the term 'culture', as defined above, since the modus operandi in prehistoric archaeology of naming 'cultures' on the basis of the similarities or differences among artifact assemblages is very much dependent upon the sequence of discovery and is quite arbitrary. This is a particularly acute problem in East European archaeology: Oftentimes 'cultures' were originally defined on the basis of materials from one or two sites, the 'culture' was then subdivided (usually in several different ways), and during the course of subsequent excavations these 'cultures' necessarily suffered numerous redefinitions and re-subdivisions. Renfrew (1979) has also emphatically stated:

> Both the manipulation of artefacts into typological series ('seriation') and their division into hypothetical spatio-temporal entities ('cultures') must be rejected as meaningful explanatory procedures. Each, however, within appropriate limits and with the explicit formulation of the underlying assumptions, can be a perfectly acceptable mode of analysis: seriation within a limited area will remain a good approach to relative chronology, and naming by 'cultures' will continue to be a convenient shorthand, just as we still for convenience sometimes use terms like 'neolithic' or 'bronze age', which now likewise hold no explanatory content or potential.

The definition of 'culture' within the context of archaeology is far from being resolved: In fact, it would probably be better to avoid the term altogether. However, until a more appropriate classificatory terminology is developed, Renfrew's suggestion that 'culture' be used as a "convenient shorthand" together with its underlying assumptions will be heeded in this work.

(2) V. Dumitrescu (1963a) had subdivided the Cucuteni A period into

four phases according to the following scheme:

A1 = bichrome ware and bichrome ware with incising; incised ware;
A2 = trichrome, bichrome and incised wares;
A3 = trichrome ware and incised ware (bichrome ware disappeared); and,
A4 = trichrome ware, new bichrome ware (incised ware has disappeared).

(3) As opposed to the Pre-Cucuteni and Cucuteni AB and B periods, which were categorised according to motifs as well as their method of execution, the Cucuteni A phases (i.e. A1, A2, A3, A4) are defined strictly on the basis of decoration method (i.e. use of two colors, three colors, incising). Since the dramatic change from incised/excised decoration to advanced pre-fire polychrome painting did not appear to have any intervening period of experimentation, the above scheme was an attempt to organise the materials from the point of view of the evolution of technology. Thus, because all excavations were providing trichrome materials and trichrome together with bichrome, it was thought that some earlier, transitional phase must have existed with a simpler method of paint decoration. With this in mind, Radu Vulpe (1957) had defined a 'Proto-Cucuteni' phase in which only bichrome ware existed. Due to the fact that the chronological terminology was becoming too cumbersome, V. Dumitrescu (1963a) had formulated his numbered sequence and at the same time changed Vulpe's 'Proto-Cucuteni' to 'Cucuteni A1'. However, up until the present time, no one has yet found the hypothetical 'A1' phase (bichrome ware only) in a closed context. This early bichrome ware, white on red, does not occur frequently but always together with trichrome ware; for instance, it has now been found at Ariuşd in south-eastern Transilvania and at Bodeşti-Frumuşica in Moldova, but does not occur at all east of the Siret River. It is now generally recognised that no separate 'A1' level will ever be found with the result being that some researchers have now collapsed the A1 and A2 phases into 'Cucuteni A1-A2' (V. Dumitrescu 1974a; Comşa 1974-1976).

What should be emphasised here is that the absence of any transitional stage in painting experimentation is an additional indication that the trichrome technique was not autochthonous in the Cucuteni-Tripolye culture but was derived from the Petreşti culture of central Transilvania. It is worthy to keep in mind that bichrome and trichrome painting coexist in the Petreşti ceramic inventory, beginning with the end of Petreşti A which is comtemporaneous with Pre-Cucuteni III-beginning Cucuteni A (cf. fig. 1). Therefore, the idea of bichrome and trichrome painting was probably adopted by Cucuteni potters as a unified technological repertoire and then combined painting with incising, which derived from the older Pre-Cucuteni tradition; incising is not found in combination with painting on Petreşti pottery. Moreover, it appears as no surprise that the site of Ariuşd, which is located near the region of the Petreşti culture, would have bichrome ceramics as well as sites like Izvoare and Bodeşti-

Frumuşica which are located directly across the Carpathians and that sites east of the Siret and in the USSR should not have this archaic bichrome ware at all. This 'A1-A2' phase (in actuality 'A2' only) with bichrome and trichrome wares was evidently an early regional manifestation.

Concerning synchronic variation in ceramic production, the Transilvanian zone ('Ariuşd' or 'Erösd') of the Cucuteni-Tripolye culture has definite regional qualities which serve to set it apart: Along with the bichrome and trichrome wares is another type of bichrome pottery of completely different manufacture. Rather than being fired in an oxidising atmosphere, this pottery was completely reduced resulting in a totally black paste throughout. The surface decoration consisted of wide, smooth channels and some incising with intervening spaces painted with a post-fire application of haematite. This black ware is encountered often on Cucuteni sites in southe stern Transilvania (e.g. at Ariuşd, Malnaş, Bod-Priesterhügel) but fragments occur sporadically across the Eastern Carpathians.

The diachronic connection between phases A2 and A3 has also been put into question (Comşa 1974-1976). If phase A2 has not been found east of the Siret River, then what was happening between the Siret and Prut Rivers? Did Pre-Cucuteni III communities continue on or did the A3 phase already begin? According to its definition, during the Cucuteni A3 phase bichrome ware was abaondoned but the Pre-Cucuteni incised ware continued. One of the problems is that the archaic incised ware continued in the Siret-Prut interfluve (e.g. Hăbăşeşti, Truşeşti, and Cucuteni) but not west of the Siret (V. Dumitrescu 1974a). This has prompted the idea that sites between the Siret and Prut Rivers were influenced by Tripolye A populations to the east (V. Dumitrescu 1974a). However, an important point has been overlooked: Changes in technology (i.e., the adoption of trichrome painting) were not everywhere uniformly adopted, and when these changes became permanent, it is not surprising that the older technological tradition (i.e. incising) lingers on. In fact, what we can see is a gradation in the adoption of trichroms ware and the persistence of archaic incised ware from the Carpathians--where incised ware does not exist beyond early Cucuteni A--to the Dnestr, Southern Bug, and Dnepr Rivers where incised ware continues until the very end (i.e. Tripolye C I/Cucuteni B). In this instance, the persistence of the incised ware on sites between the Siret and Prut is a regional variation not in terms of influences from the east, but more appropriately in terms of a non-uniform adoption of certain technological skills. And as E. Comşa (1974-1976) has suggested, phases A2 and A3 probably overlapped considerably, such that their diachronic value is limited.

The final phase of Cucuteni A ('A4'), theoretically defined by the complete absence of Pre-Cucuteni incised ware, presents a problem in that it designates two types of ceramic inventories in Romania: the extreme northeast area and the central part of eastern Moldova. Both groups exhibit a new type of bichrome ware unrelated in technique. The former is represented by the site of

Drăguşeni in northeastern Romania whose ceramic inventory included a very unusual type of bichrome ware: The entire surface of the vessel was covered with smooth channels placed in horizontal, vertical, zig-zag, or spiralic patterns after which the channels were painted in white and intervening spaces in red (cf. Crîşmaru 1977). The other group of 'A4' pottery is located farther to the south in eastern Moldova and is also known as the 'Fedeleşeni type', whose inventory includes white on red and also brown on white bichrome wares. In both the aforementioned groups, trichrome ware predominates and the Pre-Cucuteni incised/excised ware has completely disappeared. But again, concerning this 'A4' phase, the same difficulties will arise as with the 'A2' and 'A3' phases: If this chronological phase has only been identified in such a small area, what was happening on the rest of the territory? The Cucuteni A period is a functional relative chronological designation for a time when trichrome painting was being adopted as a means of ceramic decoration. Moreover, considering the substantially large geographic zone, variation in the time and manner of adoption of technological inventions is to be expected. During the first half of this century, the many variations in ceramic inventories were understood as diachronic, but it now appears that Cucuteni A2, A3 and A4 at least partially overlap.

(4) The Cucuteni AB period has been subdivided into two phases: AB1 and AB2 (V. Dumitrescu 1963b). Phase AB1 is characterised by the appearance of the AB$\alpha$, $\alpha$, and $\beta$ styles; AB2 was defined as the predominance of the $\gamma$ and $\delta$ styles (V. Dumitrescu 1941-1944). Although H. Schmidt had originated the designation Cucuteni 'AB', he had intended that it be merely a transition, not necessarily a separate and discrete period complete with its own set of phases; therefore, all of this ware was placed under "Cucuteni B" in Schmidt's site report (cf. Schmidt 1924; 1932:75, note 1). V. Dumitrescu (1963b) admits that, although AB ware has been found in many places in eastern Romania, very few sites can actually be said to belong exclusively to this period (e.g. Traian-Dealul Fîntînilor, Corlăteni, Ghelăieşti); and in fact this AB ware is quite rare in the USSR, appearing sporadically in the northern Prut-Dnestr interfluve. Therefore, although Cucuteni AB is often equated chronologically with the phase Tripolye B II--and is presented here as such in the synchronisation chart (fig. 6)--and although both Cucuteni AB and Tripolye B II both serve as transitions from trichrome to monochrome wares, the latter was defined on the basis of different criteria (cf. note (7) infra). It is tentatively suggested here that the entire "Cucuteni AB" phenomenon has all the appearance of a regional as well as a temporal variation for central and northern Moldova.

(5) V. Dumitrescu (1963b) has divided the B period into three phases: During B1, the $\delta$ style predominated with the first occurrence of $\varepsilon$; during B2, the $\varepsilon$ style predominated with decline in $\delta$, and the first appearance of $\zeta$; and in the final B3 phase the $\zeta$ style predominated. Among the inventory of motifs for this

period is the first occurrence of anthropomorphic (female) and zoomorphic motifs (figs. 27-30).

The major problem with assigning diachronic status to the six styles is that as many as four styles may occur on the same vessel (figs. 25 and 26). However, an approximate chronological division may be made by grouping together styles α - δ for Cucuteni AB and styles ε and ζ for Cucuteni B. This is supported by the multiple occupation levels at the sites of Cucuteni-Cetăţuia and Bodeşti-Frumuşica where all styles occur; Traian-Dealul Fîntînilor which has only styles α - δ ; Truşeşti, Tîrgu Ocna-Podei, and Valea Lupului with styles ε and ζ only; Schipenitz and Petreny with ε only. However, any further subdivision of the styles has no chronological value whatsoever. Furthermore, styles α - δ appear concentrated in eastern Romania whereas the latter two styles, ε and ζ , appear from the Eastern Carpathians to the Dnepr River.

(6) As with the Cucuteni sequence, there is little agreement as to subdividing the Tripolye A, B, and C periods. For instance, concerning the 'A' period alone, Bibikov has suggested two subdivisions; Danilenko--four subdivisions; and Černyš--six subdivisions (Černyš 1981).

(7) T. Passek (1949:55) had defined the Tripolye B period from the presence of polychrome ware as follows: Tripolye B I is defined by painting black and white on red and Tripolye B II is defined by painting red and black on white as well as the first appearance of the large population centers (cf. chapter IV)--and had defined Tripolye C I/γ I by the predominance of monochrome ware. Recently, T. Movsa (1972) has wanted to include the C I/γ I phase under the Tripolye B period as 'Tripolye B III' which would have all pottery with zoomorphic and anthropomorphic figures as its leitmotif. V. Markevič (1981:56-58) prefers to preserve Passek's phase terminology but to refine the defining characteristics of the C I/γ I phase using the following criteria:

- --monochrome painting, black on clay, in combination with thin black or red lines;
- --among the decorative motifs are sun and lunar symbols floral designs, female figures, animals;
- --intensive disintegration process of spiralic ornamentation; and,
- --complete disappearance of archaic (Tripolye A) incised ware.

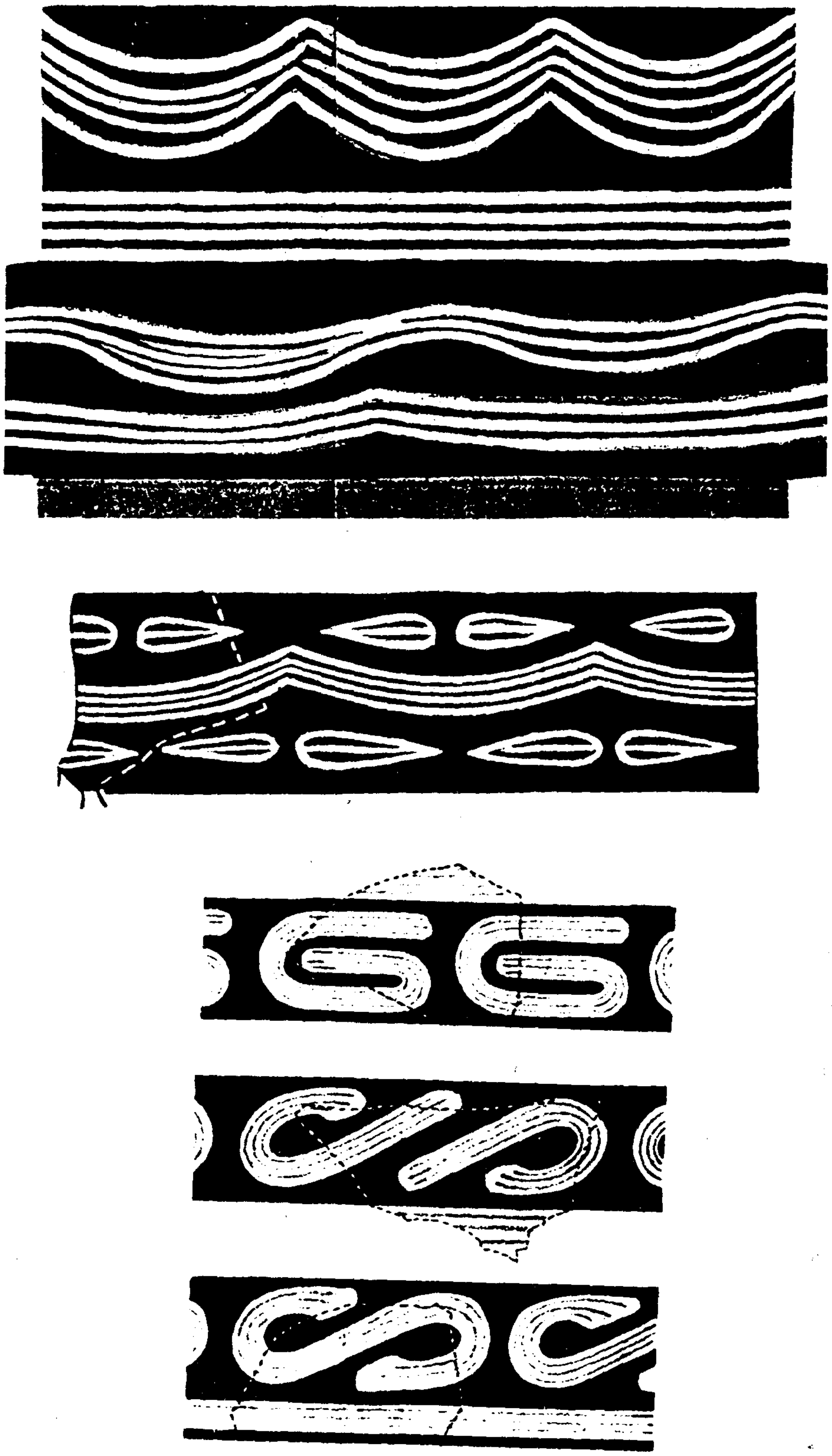


Fig. 18 Cucuteni AB motifs: $\alpha$ style

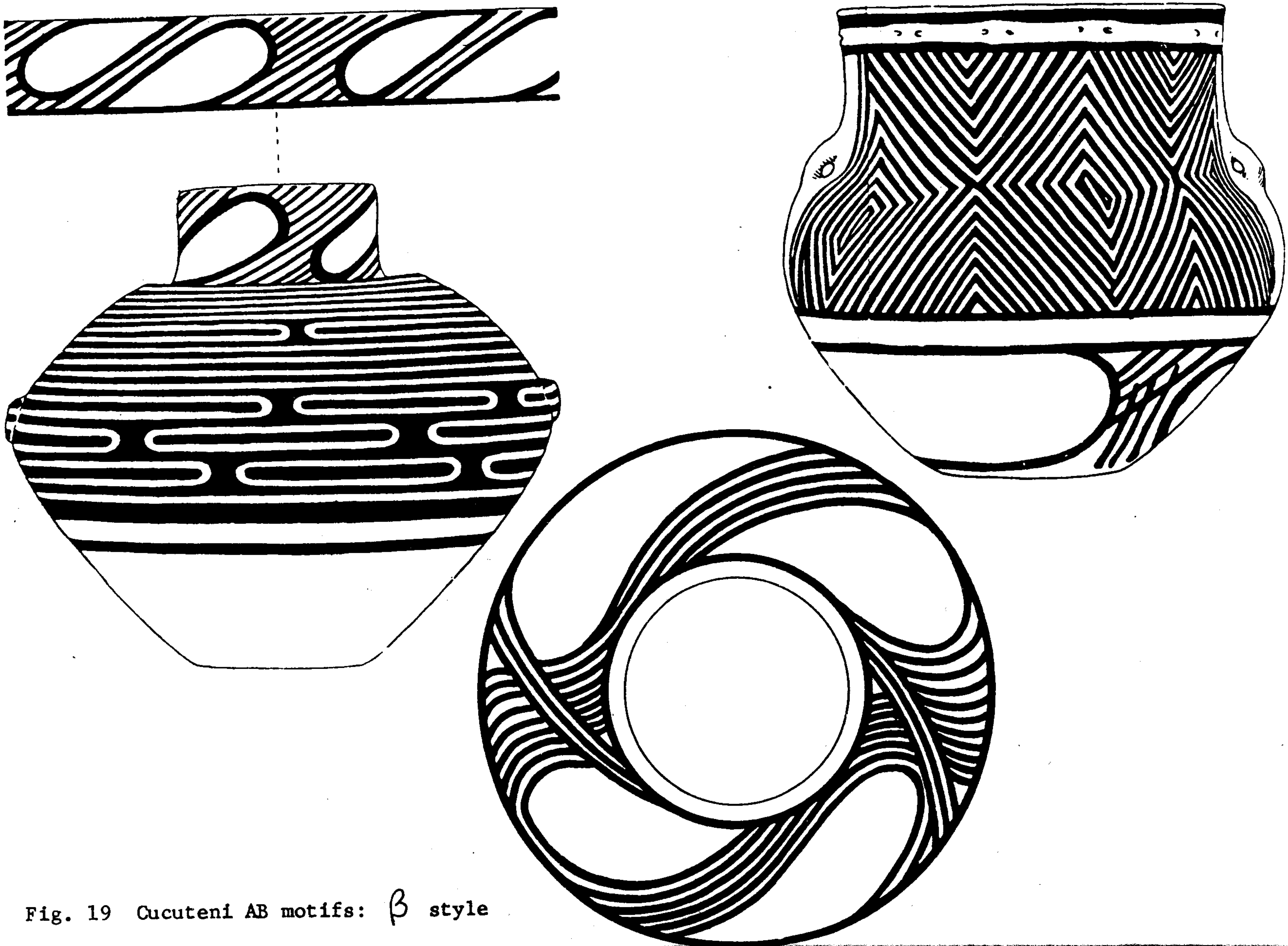


Fig. 19 Cucuteni AB motifs: β style

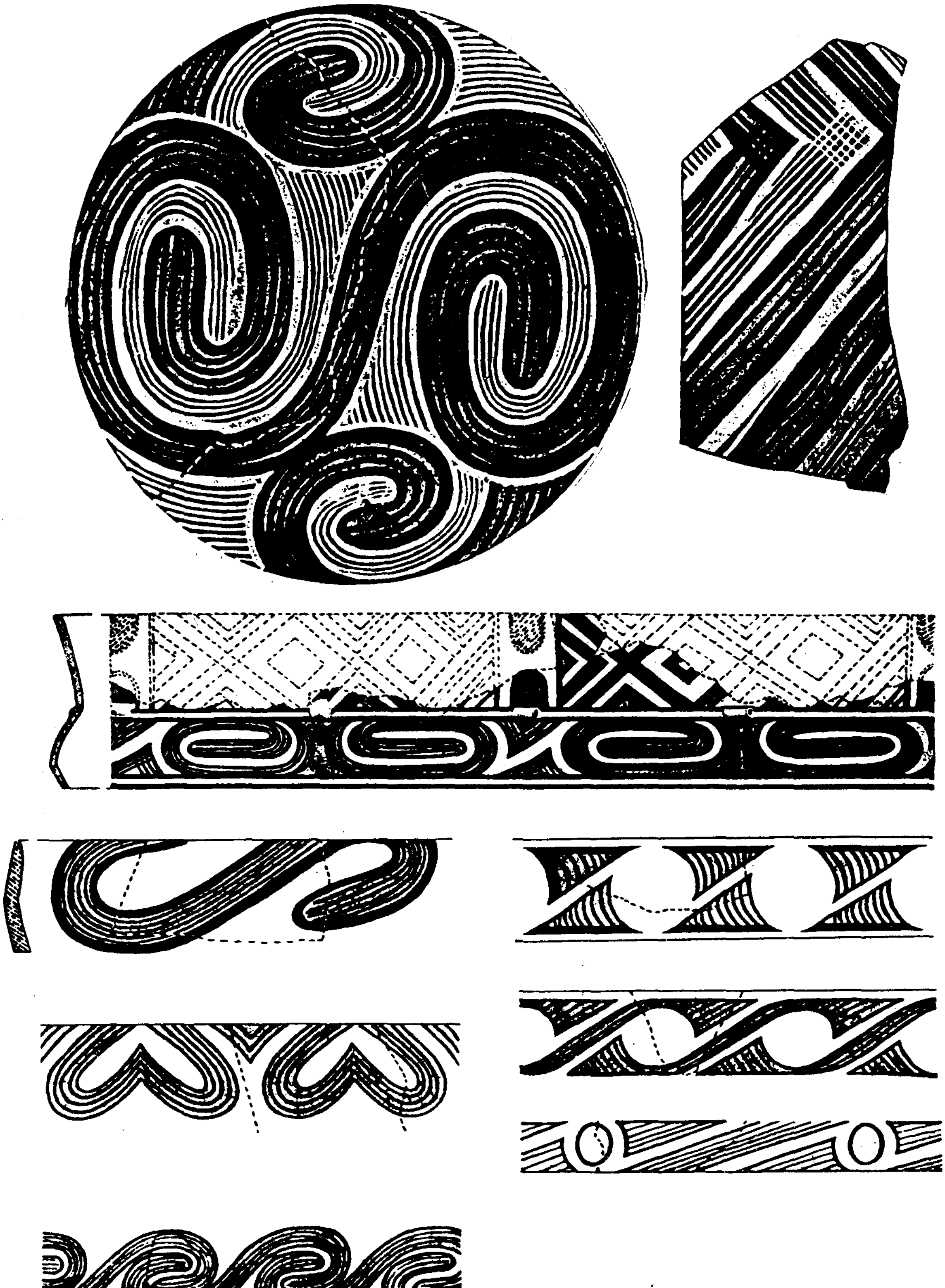


Fig. 20 Cucuteni AB motifs: γ style

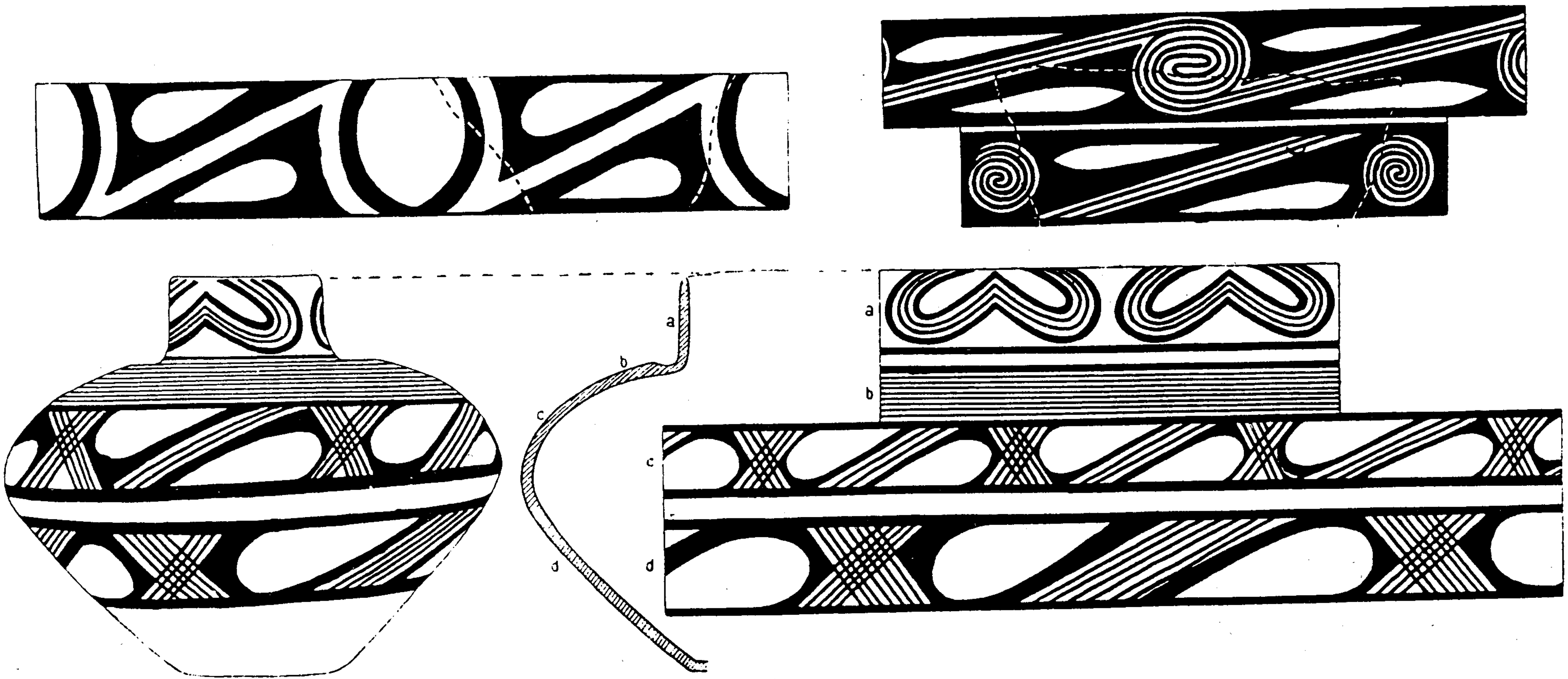


Fig. 21 Cucuteni AB motifs: δ style

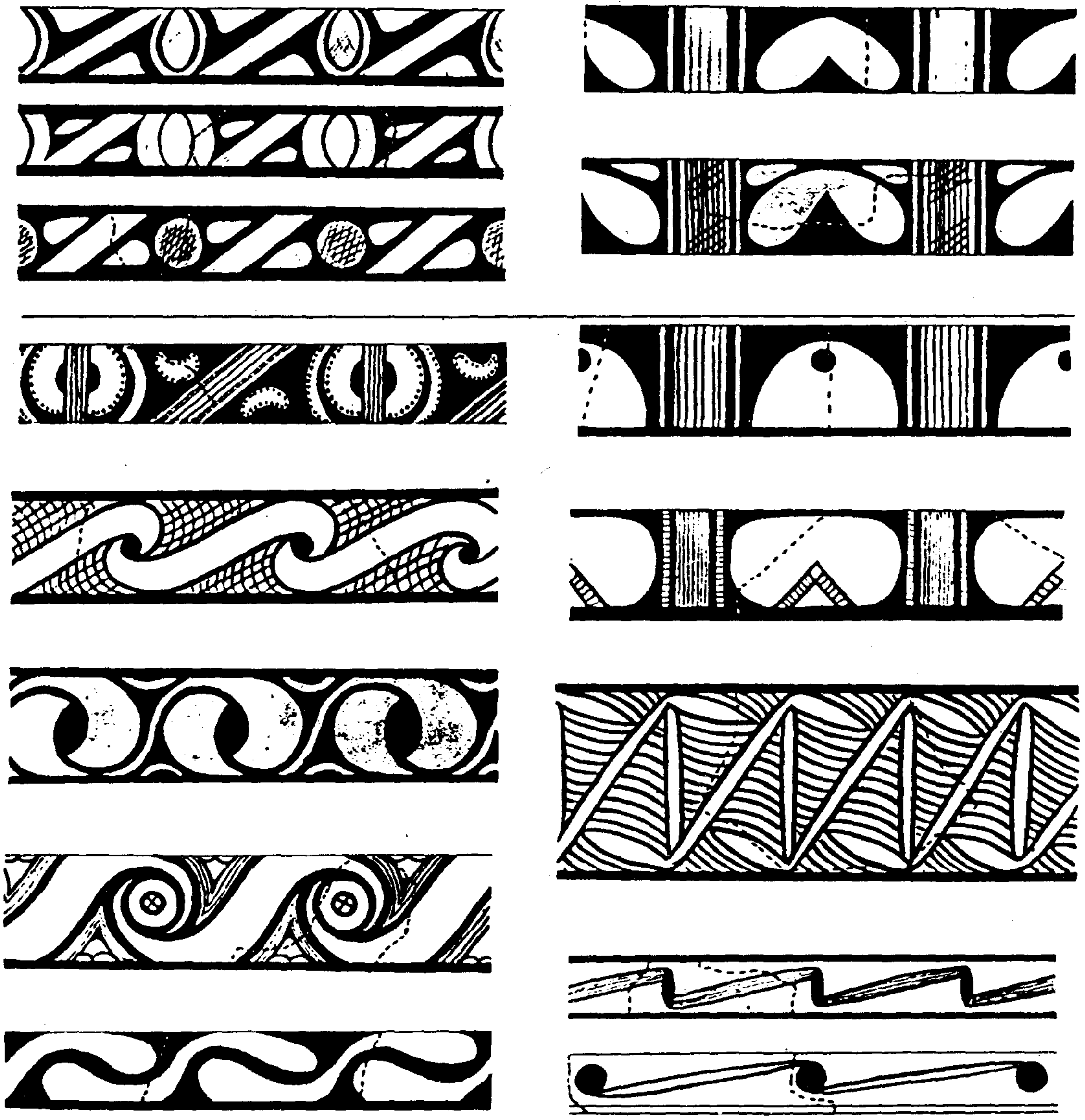


Fig. 22 Cucuteni AB and B motifs: δ style (upper); ε style (lower).

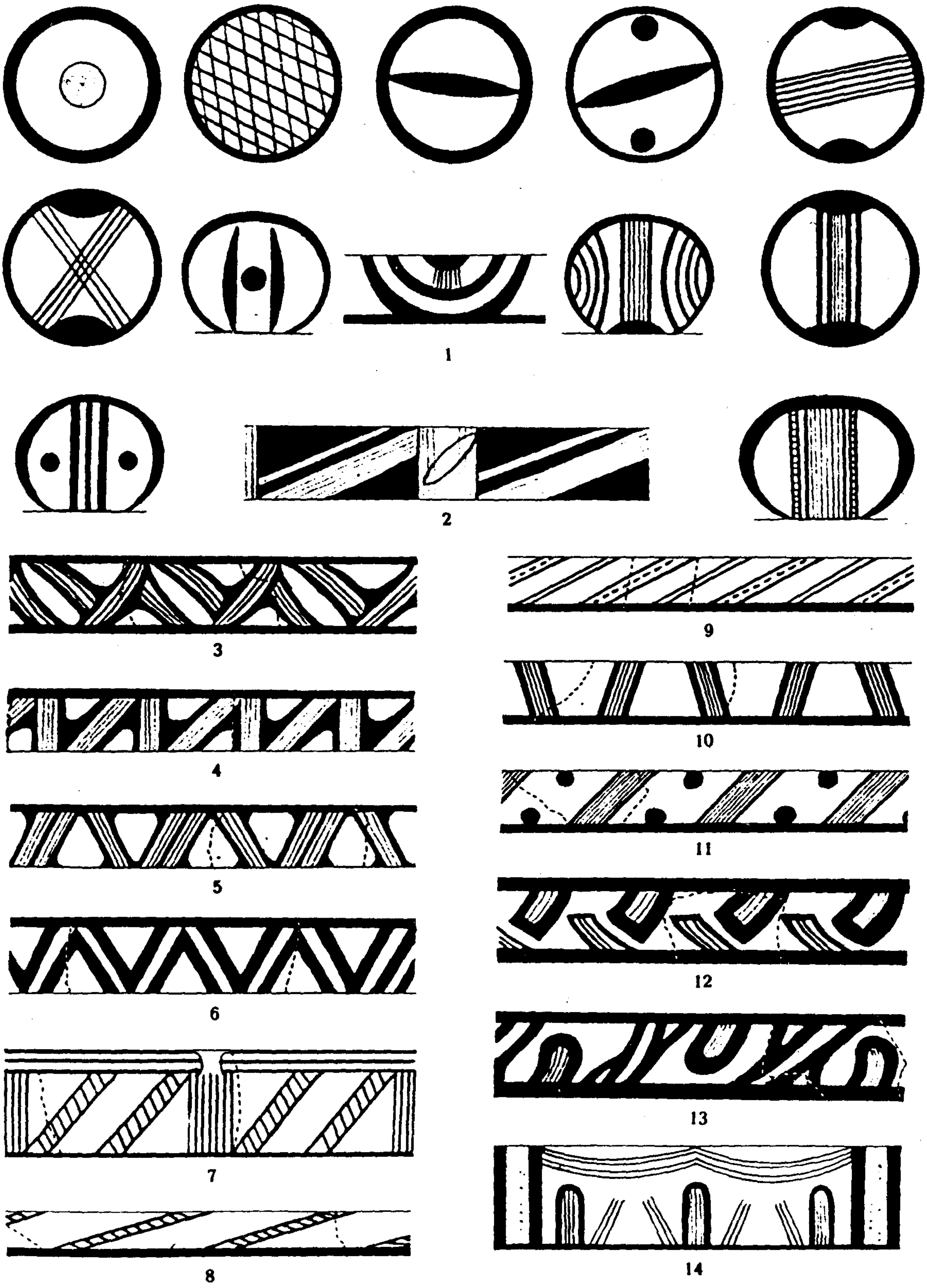


Fig. 23 Cucuteni B motifs: ε style "eye" motif (1); δ style (2); ε style (3-13); ζ style (14).

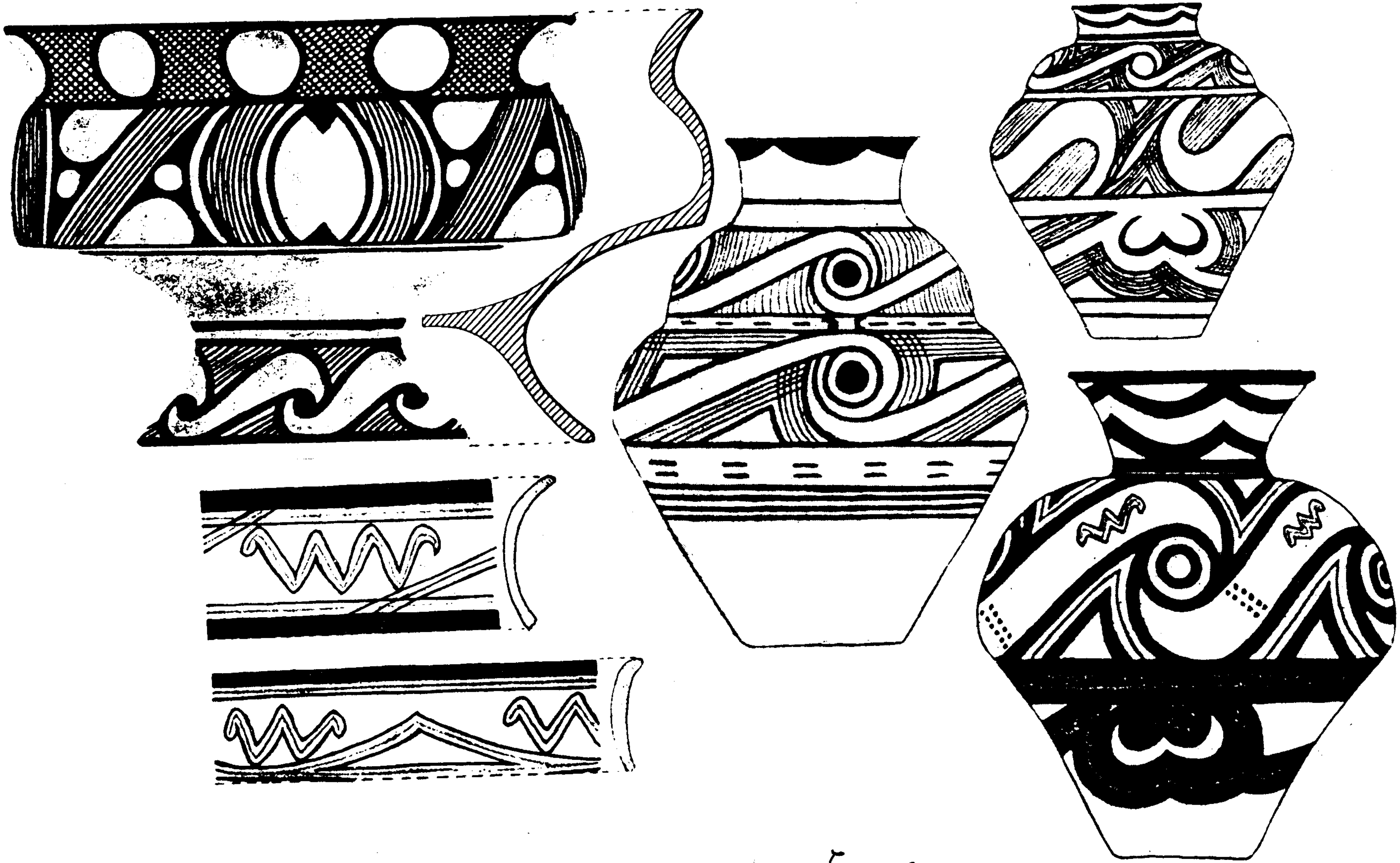


Fig. 24  Cucuteni B motifs: ζ style.

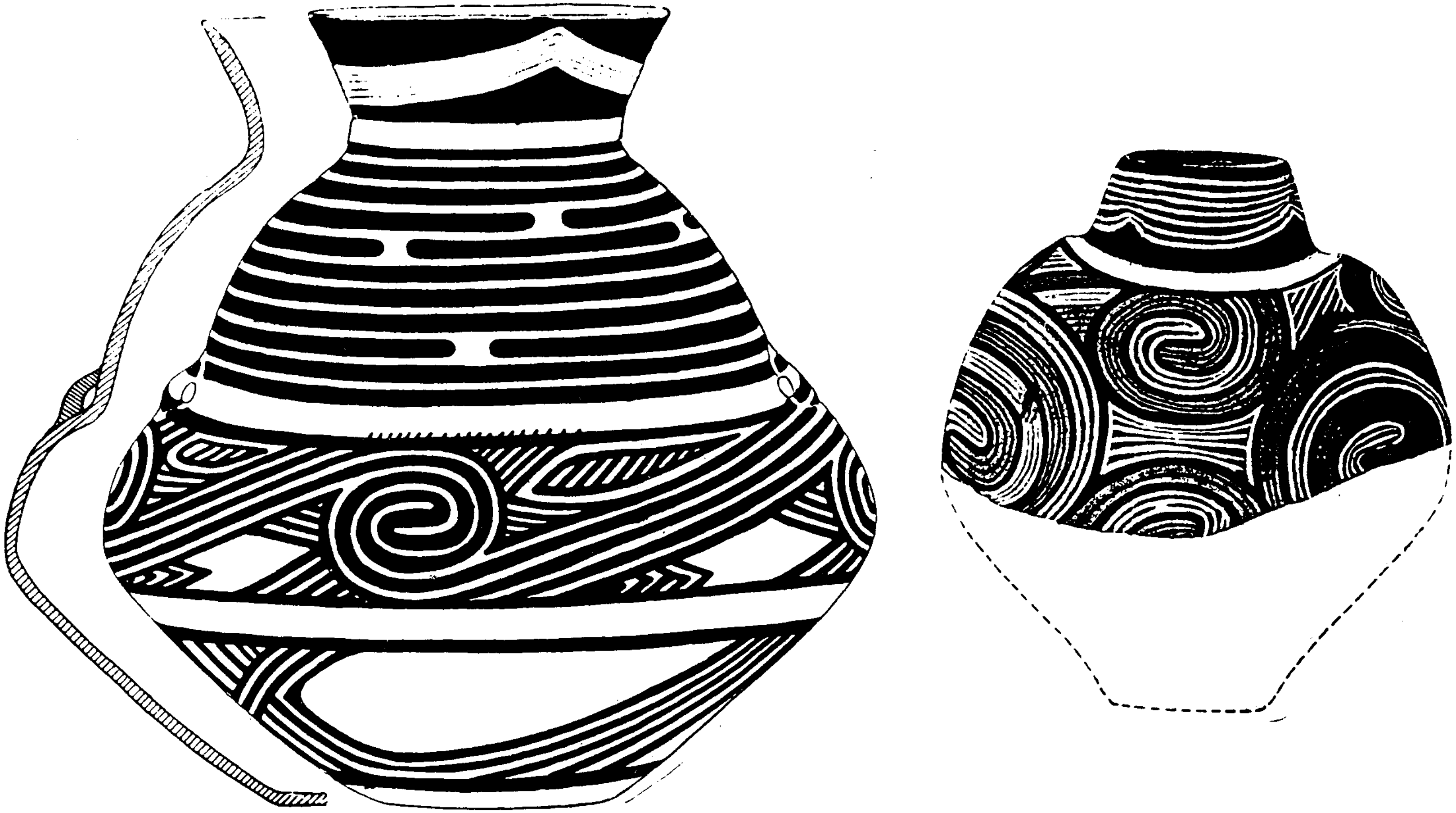


Fig. 25 Vessels with multiple styles: left, $\alpha$ (neck) and $\beta$ (body)
right, $\alpha$ (neck) and $\gamma$ (body)

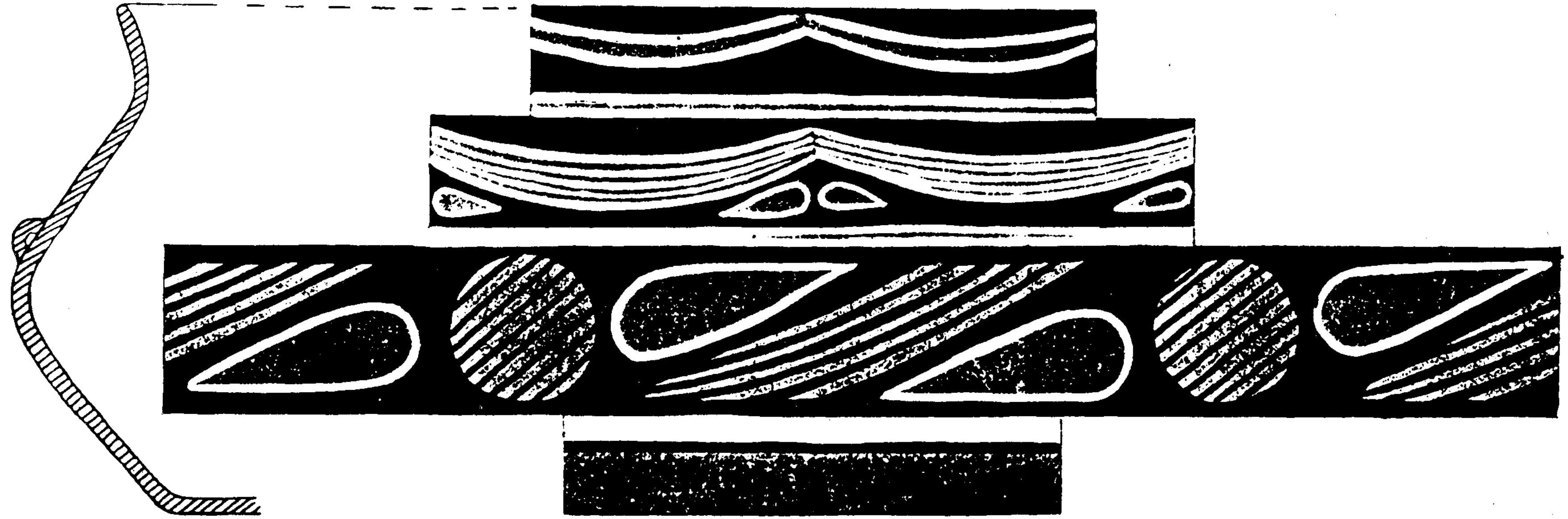


Fig. 26 Vessel with multiple styles. Neck and shoulder: $\alpha$ style,
Body: $\delta$ style.

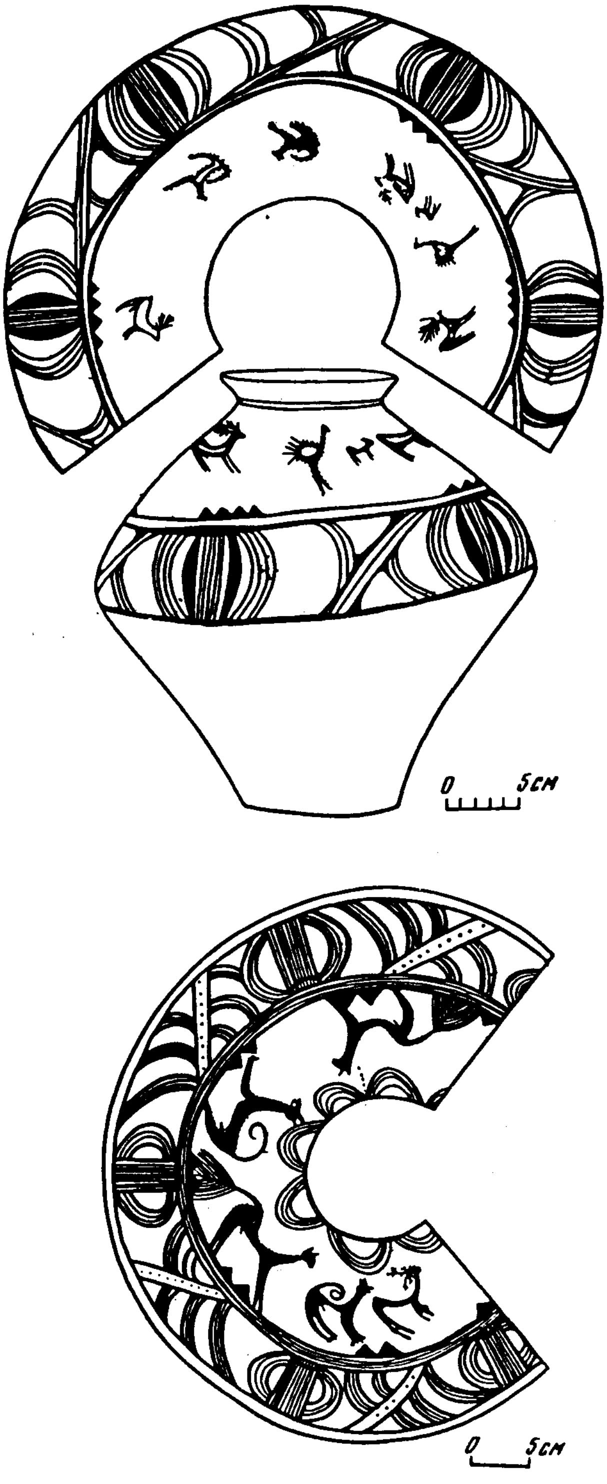


Fig. 27 Representations of wild animals on Tripolye C (=Cucuteni B) vessels.

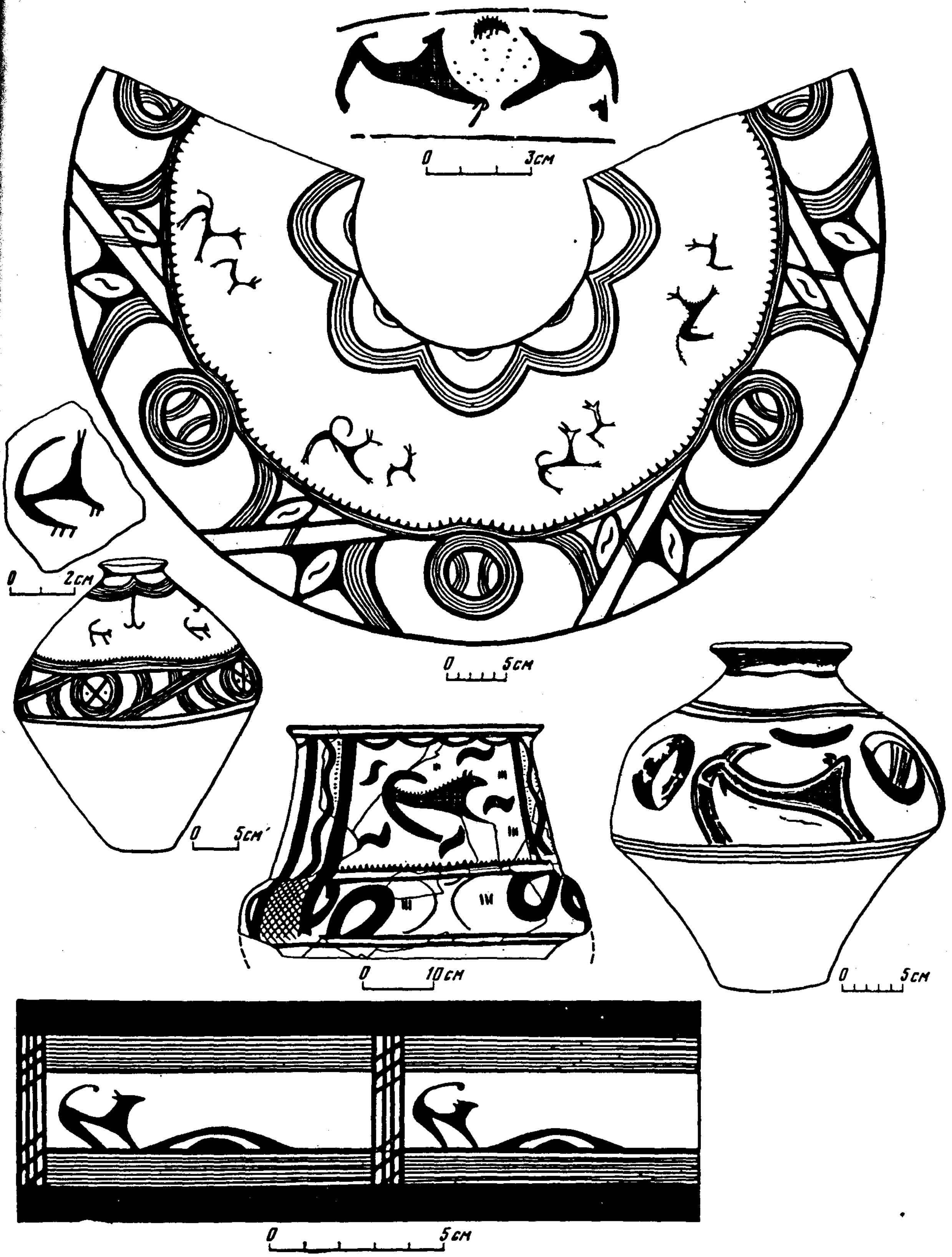


Fig. 28 Representations of dogs on Tripolye C (=Cucuteni B) vessels.

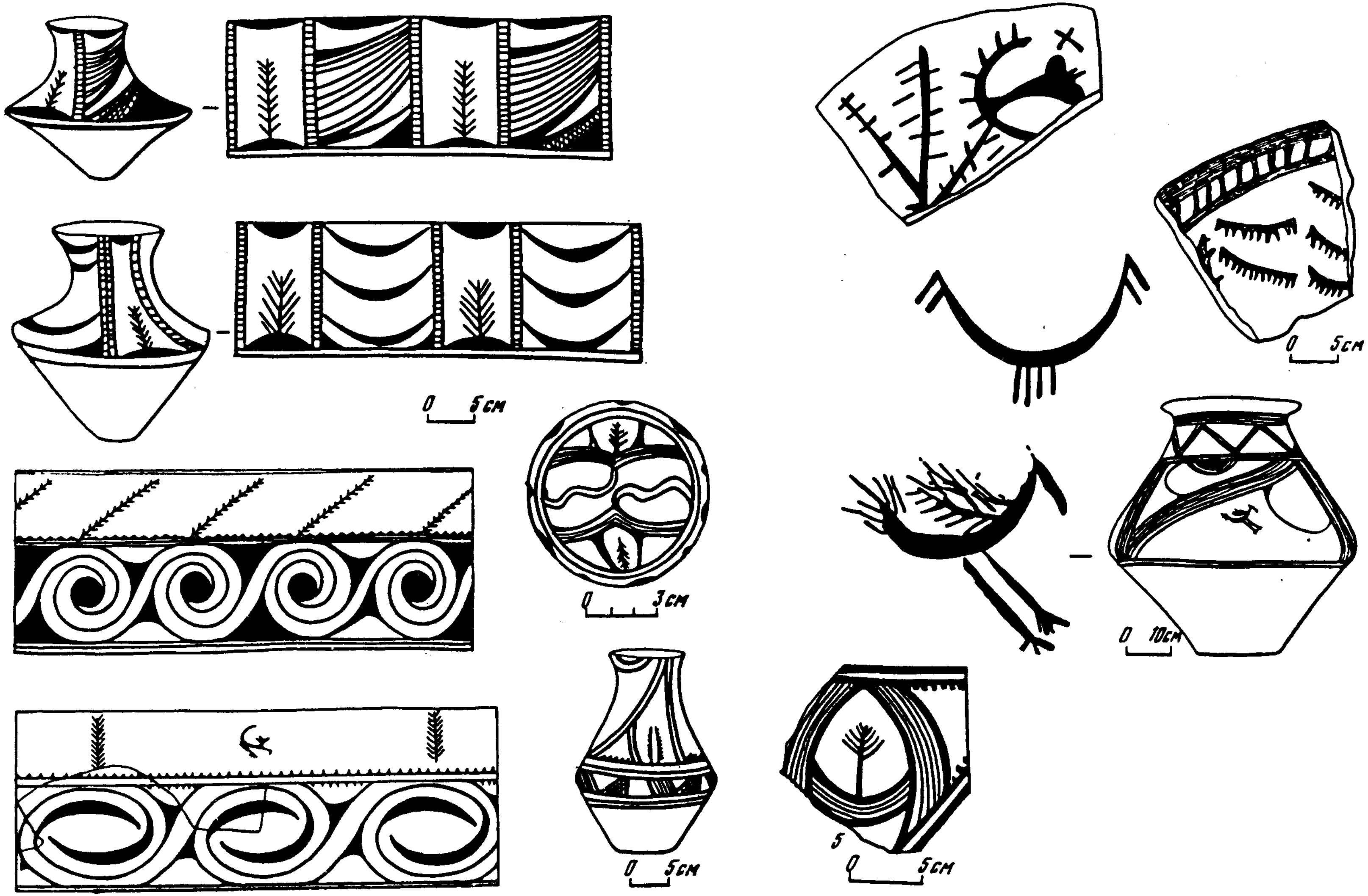


Fig. 29 Representations of flora and birds on Tripolye C (=Cucuteni B) vessels.

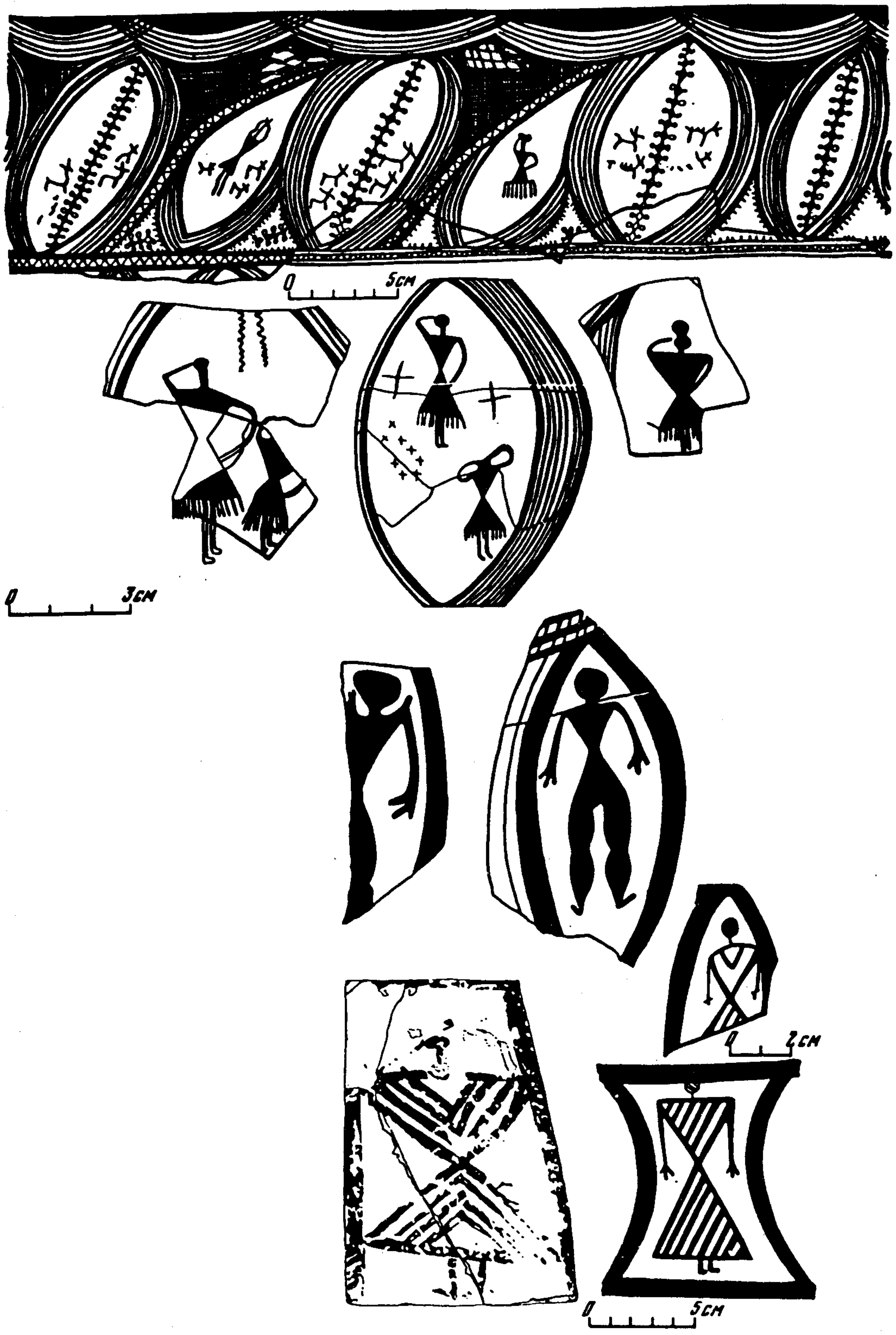


Fig. 30  Anthropomorphic motifs on Tripolye C (=Cucuteni B) vessels.

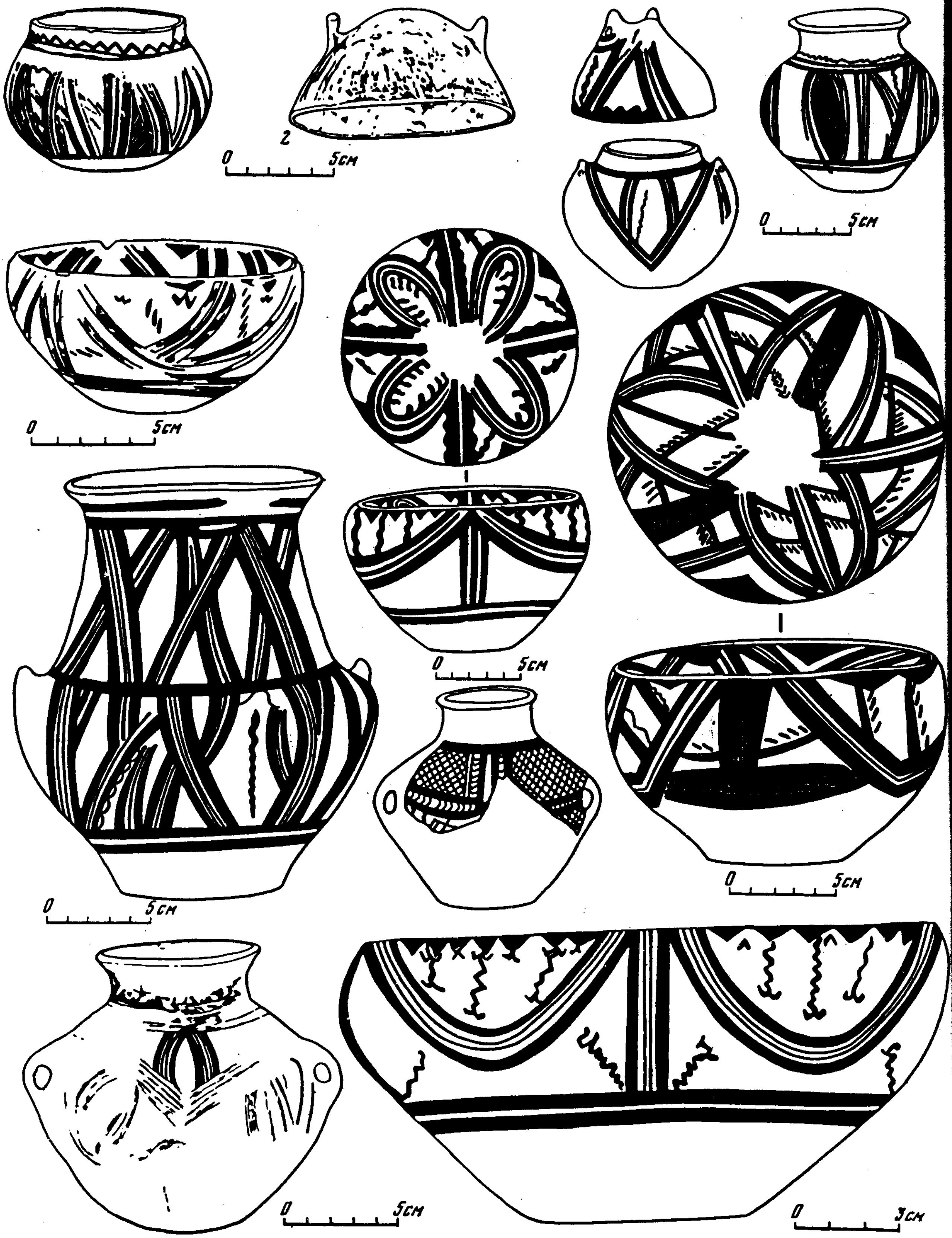


Fig. 31 Ceramics showing design devolution from the Vykhvatintsy burial ground--transitional to early Bronze Age.

# CHAPTER III

## The Manufacturing Process

### III.A. The geology of raw materials used in ceramic manufacture

The quality of a finished product is not only dependent upon the state of the craft and the skill of the potter but is also dependent upon the raw materials, so much so that the very existence of any industry depends on the availability and quality of inorganic and organic substances. It is therefore mandatory, before discussing the technology in detail, to consider the geological setting of the Cucuteni-Tripolye cultural area as well as the occurrence and origin of the natural resources used to manufacture and decorate pottery and the potential of those resources for prehistoric exploitation.

### III.A.1. Geological history and clay formation

The territory occupied by the Cucuteni-Tripolye culture represents, geologically, the Scythian Platform and part of the adjoining Ukrainian Shield (Burchfiel 1976). The western part of this culture area, located between the Eastern Carpathians and the Prut River, is referred to as the Moldavian Platform (Băcăuanu 1968).

It was during the Sarmatian stage of the Miocene (fig. 32) that the last series of marine deposits were made, which formed the entire relief of the Moldavian Platform. These deposits were made during a transgression of the Black Sea, which was made possible by a negative epeirogenetic movement, or lowering, of the Platform. These Sarmatian sediments constitute mostly detrital rocks, such as clay, marl, sand, sandstone conglomerates, together with some horizons of calcareous rocks (Băcăuanu 1968:28-30).

At the end of the Lower Sarmatian and at the beginning of the Middle Sarmatian, a new, uplifting movement raising the Moldavian Platform was begun. This uplifting continued to the end of the Miocene and into the Pliocene and was responsible for the gradual regression of the marine waters to the southeast.

With the regression of the marine waters, beginning during the Lower Sarmatian in the north and the Middle Sarmatian in the south, this maritime platform began its terrestrial (i.e., non-marine) evolution. At first, it was transformed into a plateau relief, afterwards into hilly terrain which continues to be modified even to the present day.

The lithological characteristics of the Sarmatian formations show that deposition of sediments occurred in shallow conditions. However, these great deposits sometimes reach over 1000 m in thickness, indicating that the sea bottom underwent subsidence concomitant with

Fig. 32

Miocene geological stratigraphy as defined for Eastern Romania.

7 m.y.

| | | | |
|---|---|---|---|
| MIOCENE | (Upper) | SARMATIAN | Kersonian |
| | | | Bessarabian |
| | | | Volhynian |
| | | | Buglovian |
| | (Middle) | TORTONIAN | |
| | | HELVETIAN | |
| | (Lower) | BURDIGALIAN | |
| | | AQUITANIAN | |

26 m.y.

rising accumulations of sediments (Băcăuanu 1968). The depositional environment and conditions of sedimentation were not always uniform across the Platform from north to south and from west to east. For instance, at the contact of the sea with the Subcarpathians, the Volhynian horizon is represented by a delta facies with sand and gravel deposits; directly to the east, follows a littoral--sub-littoral facies consisting of clay-sand, marl, sandstone, and oolitic limestone. Finally, farther to the south follow deeper facies of clay-marl deposits over 200 m thick. In addition, water chemistry produced variations in clay/rock types on a localised scale.

In conclusion, the Cucuteni-Tripolye populations had settled in a region of sedimentary rock formations. In general, on the Moldavian Platform, clays and marls predominate together with some lenses of sand and poorly cemented sandstone. The clay deposits had been produced by the following factors: subsidence of the Moldavian Platform, subsequent transgression by the Black Sea, weathering of rocks from the Eastern Carpathians and the Podolian Uplands, deposition of weathered materials over the submerged Platform, and a gradual uplifting of the Platform to reveal much of the present-day landscape.

### III.A.2. Iron oxides

Red iron oxide (haematite), hydrated iron oxides (haematite with absorbed water), and iron hydroxides (goethite, limonite) occur widely as weathering products of all iron-containing minerals and are frequently intermixed with many other substances including colloidal silica, clay minerals, aluminum hydroxides, etc. Goethite and limonite may also accumulate as direct precipitates from marine waters and also occur in bogs. Haematite occurs chiefly in sediments and their metamorphosed equivalents; it is also found in soils and as a weathering product of iron-bearing minerals. These sedimentary iron oxides used in red slips on Cucuteni-Tripolye ceramics are quite widespread over the Moldavian Platform and Eastern Carpathians (Rădulescu and Dimitrescu 1966).

Concerning its appearance in nature, the red, earthy haematite, or "red ochre", is easily recognisable; upon hydration it may become softer and may turn slightly brownish. Goethite, or "yellow ochre", differs from haematite by being more yellowish in color; upon dehydration goethite will yield haematite. Limonite is not a specific mineral but is an omnibus term for a range of mixtures of the above-mentioned iron oxides and is amorphous or poorly crystalline; its main constituent is goethite, and the color ranges from yellow through various shades of orange, brown, and red, depending upon composition and water content.

### III.A.3. Calcium/magnesium carbonates

Since the Cucuteni-Tripolye region had been inundated by the marine waters of the Black Sea, sedimentary rocks (i.e. limestones and marls) consisting of calcium- and magnesium-carbonates are omnipresent. Limestone refers to any sedimentary rock consisting essentially of carbonates, the two most important of which are calcite and dolomite. Marl is a calcareous mudstone which consists of clay minerals, calcium/magnesium carbonates, and very finely divided quartz and is a marine sedimentary rock. Marl is not plastic when wet, as is clay, but may dissolve when immersed in water and thus yield the necessary constituents for a light-coloured slip.

### III.A.4. Manganese oxides

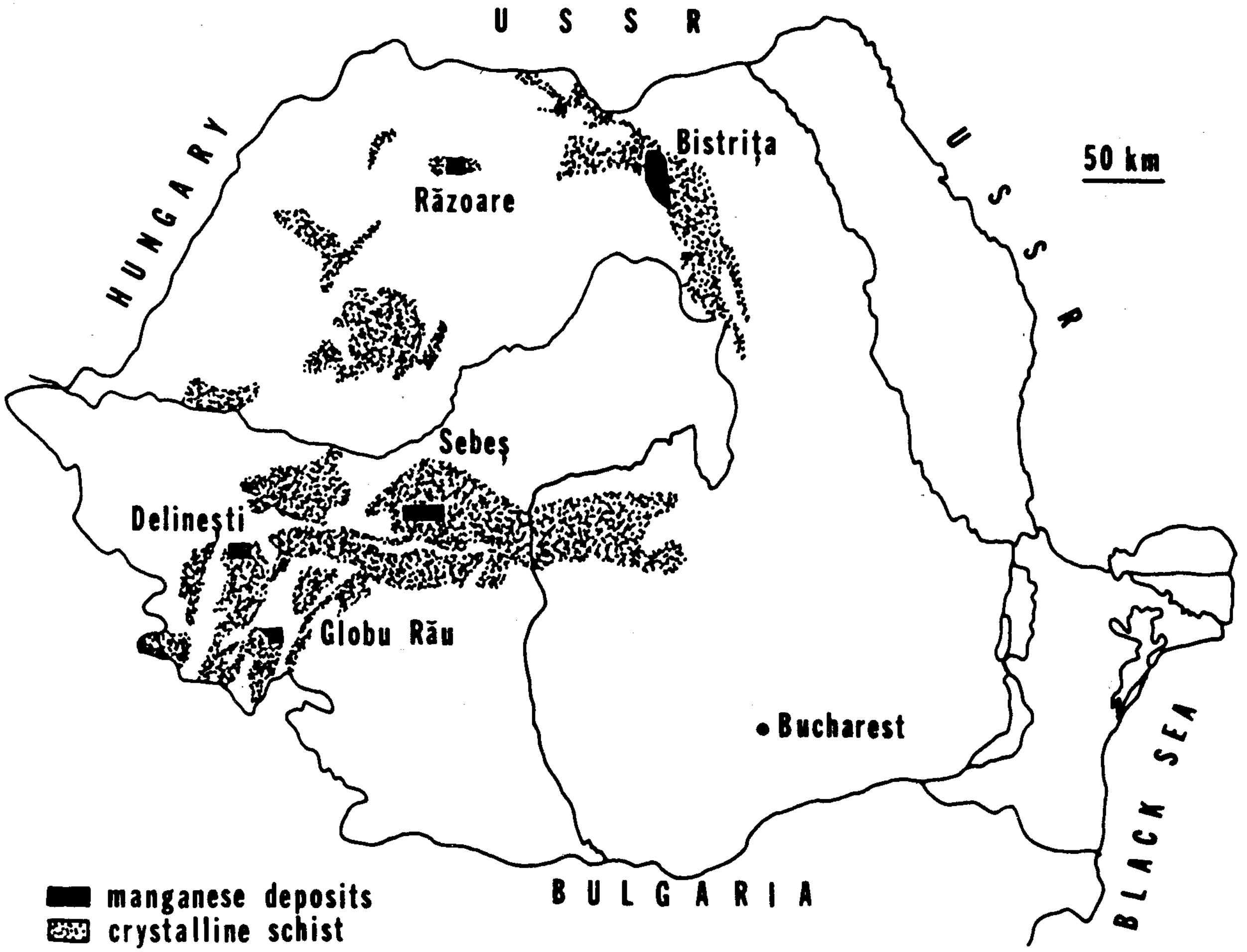
The use of manganese- and manganese/iron-bearing minerals for black slips, although well documented, is still a somewhat problematic phenomenon for this culture: The area occupied by the Cucuteni-Tripolye culture is enormous, and manganese minerals were used everywhere on a consistent basis and throughout the painted-ware sequence; however, the deposits of manganese ores which have been reported in the literature are only suitable for modern industrial exploitation and are located on the peripheries of the Cucuteni-Tripolye territory (Savul 1927, 1938; Savul and Ianovici 1958; Ianovici 1956; Idriceanu, Bigu and Boţoman 1966; Krajewski 1938; Shnyukuv and Orlovsky 1980). In addition, there is no direct evidence of actual prehistoric exploitation of Carpathian deposites, such as sherds, tools, etc. However, the Eastern Carpathians have not been surveyed for archaeological sites. Nevertheless, some source(s) of manganese had to have been utilised by this culture over a wide geographical area and for a very long time; therefore, all geological sources, reasonably exploitable by ancient craftsmen, must be considered.

Two types of manganese deposits could have been used: the sedimentary-metamorphic ores of the Eastern Carpathians and/or the residual deposits in bogs and soils across the Podolian Uplands and the Scythian Platform.

Concerning the former, map 11 shows all manganese ore deposits associated with the Southern Carpathian (Sebeş Mountains, Delineşti, Globu Rău) and the Eastern Carpathians (Răzoare and the Bistriţa River/ Bistriţa Mountains region) whose manganese ore deposits continue across the current political border and into the Ukrainian Carpathians (formerly known as the Polish Eastern Carpathians) (Krajewski 1938; Ianovici 1956; Savul 1938). These ores are sedimentary manganese deposits, dating to the Paleozoic, which were later metamorphosed along with the associated rocks of crystalline schists; the manganese minerals appear in the form of lenticular bodies interbedded amidst horizons of graphitic black quartz, white quartz, and micaceous schists (Savul and Ianovici 1958). These manganese deposits vary in size from small, a few meters in length as at Argestrut and Căprăria, to compact and large deposits measuring several hundreds of meters as at Iacobeni (Bistriţa deposits) (Ianovici 1956).

Today, the Bistriţa region contains over 30 sources worthy of industrial exploitation; they appear at different altitudes varying between 850 m and 1,500 m (Ianovici 1956). The manganese deposits of the Čivčin (Czywczyn) Mountains, belonging to the same geological formation but lying across the Romanian-Ukrainian frontier ("Bucovina"), appear at altitudes varying between 1,290 m and 1,480 m (Krajewski 1938).

The earliest recorded industrial exploitation of these deposits in the Eastern Carpathians was during the late 18th century, and the descriptions of these deposits may give some indication of how these deposits appeared in prehistory. Exploitation of the manganese minerals



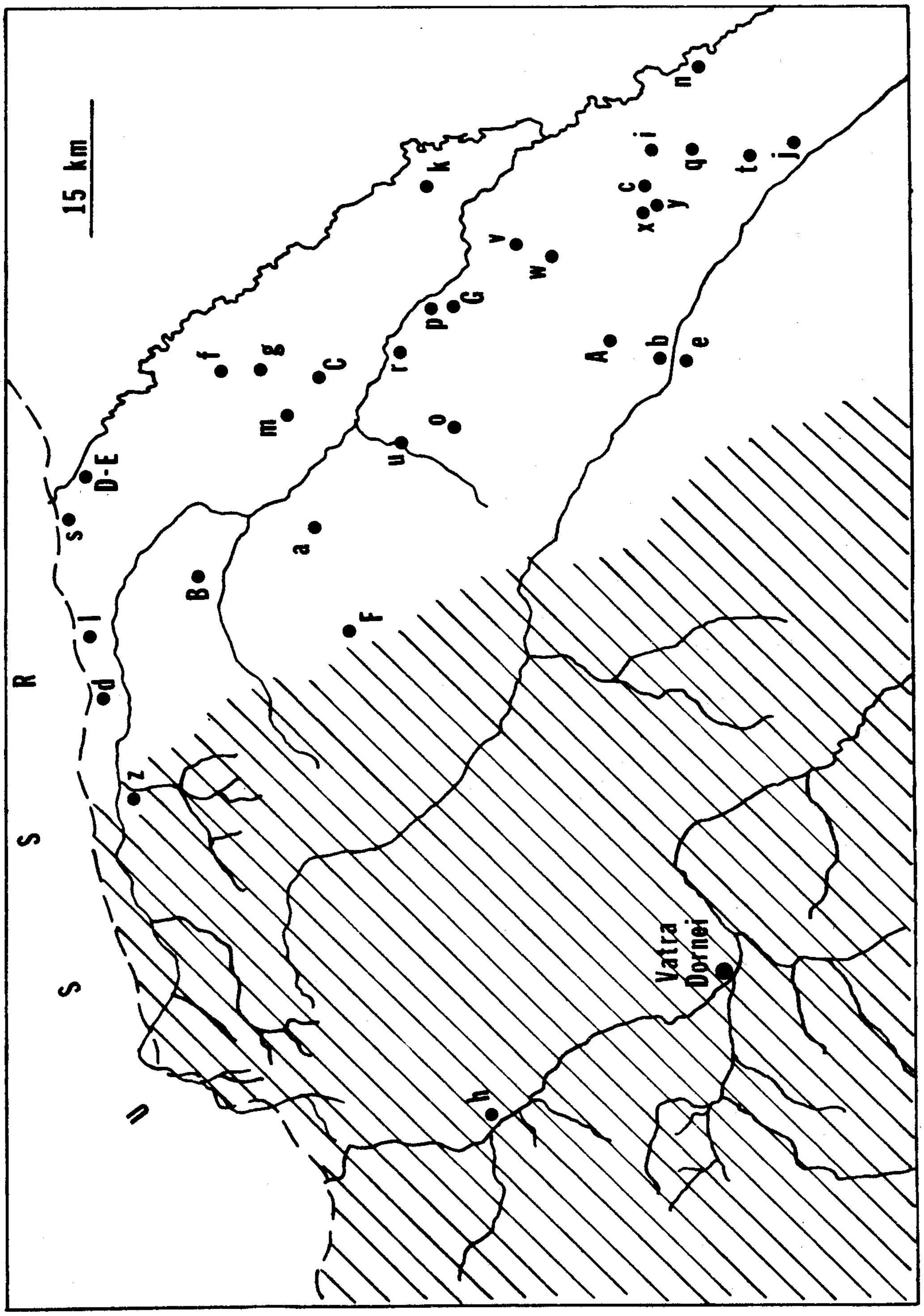
Map 11 Manganese ore deposits in Romania

Map 11a Locations of Cucuteni sites in the vicinity of the Bistriţa manganese deposits. (Information supplied by Mr. Mircea Ignat, Suceava District Museum.)

a Arbore - "Cotul Mare al Clitului"
b Baia - "Cetaţuia"
c Basarabi - "Dealul Hirburilor"
d Bilca - "Cioteni"
e Bogata - "Dealul Colacului"
f Călineşti
g Călineşti-Vasilache - "Holm"
h Cîrlibaba
i Dolheştii Mari - "Dealul Vîntului"
j Drăguşeni - "Cetăţuia"
k Feteşti - "La Schit"
l Frătăuţii Noi - "Dealul Tîrnauca"
m Grăniceşti - "La Plantaţie la Gîtlan"
n Gulia
o Ilişeşti - "Cetăţuia pe Vîrvata"
p Lisaura - "Vatra Satului"
q Manolea
r Mihoveni
s Muşeniţa
t Oniceni
u Părhăuţi - "Muncelul"
v Plăvălari - "Dealul Popii"
w Pleşeşti
x Preuteşti - "Cetăţuia"
y Preuteşti - "Halta"
z Putna - "Mănăstire"
A Rădăşeni - "Cetăţuia"
B Rădăuţi
C Romaneşti - "La Chetriş"
D Siret - "Horodiştea"
E Siret - "Dealul Ruina"
F Solca - "Slatina Mare"
G Tişăuţi

Key

lines = mountainous region


15 km
USSR
D-E
s
l
d
z
B
a
F
m
f
g
C
u
o
r
p
G
k
v
w
A
b
e
x
c
y
i
q
t
j
n
h
Vatra Dornei

took place on superficial zones only; these zones consisted of an "iron cap" (i.e., a surface layer of limonite and goethite) and a "manganese cap" or layer of oxidised manganese minerals lying above manganese silicates and carbonates. Later, during the 1880s, and continuing to the present, selective exploitation of manganese silicates and carbonates commenced, as opposed to the earlier mining of surficial products of weathering (Ianovici 1956).

The Carpathian manganese deposits contain different types of minerals: oxides and hydroxides (products of weathering), carbonates, and silicates (table 5). The former group is easily recognisable as black; manganese oxides that also contain iron will appear dark brown; manganese carbonates and silicates are various shades of grey and pink, respectively.

For the purposes of potential prehistoric exploitation, only the surficial oxides/hydroxides are relevant to the discussion here. Pyrolusite, the manganomelanes, wad, as well as manganite and bixbyite are the most common minerals on the surfaces of manganese ore deposits. Pyrolusite is the only mineral of this group to have an iron-grey colour. "Braunstein" is an old collective term for the manganomelanes and "wad": The manganomelanes are black, hard manganese ores of variable composition and with botryoidal or rhythmic structures. The latter term, "wad", refers to soft, loose, powdery, and lightweight masses that are brown to black in colour. The chemical nature of wad is complex and may consist of a whole series of manganese oxides (i.e., $MnO$, $MnO_2$, $Mn_2O_3$, and $Mn_3O_4$ and their hydrated pseudomorphs) (Frenzel 1980). Wad is probably the material with the highest likelihood of prehistoric exploitation due to its physical characteristics and immediate usability.

The Ukrainian zone of the Cucuteni-Tripolye culture likewise is rich in manganese ores; in fact, the Ukraine has the largest single reserve of manganese in the world in the "Nikopol deposit" but which is located on the Black Sea margin and thus lies too far south from the more northerly and westerly Cucuteni-Tripolye zone. There are other sources of manganese ore available and are listed, together with relevant details in fig. 33. Attention is called to the regions of the Čivčin (Czywczyn) Carpathians, the northern part of the Rahov massif, the Podolian Uplands, and the western/southwestern/northern districts, since manganese oxides and hydroxides predominate in these areas. Manganese ores are quite widespread over the Čivčin Carpathians which have been previously mentioned as a continuation of the Bistriţa crystalline schist series in Romania (Krajewski 1938; Shnyukov and Orlovsky 1980). The Rahov massif lies westerly of the Čivčin Mountains and is part of the Carpathians but is somewhat distant from the Cucuteni-Tripolye area. The Cretaceous rocks of the Podolian Uplands have yielded manganese hydroxides. More importantly, however, are the latest ("Recent") residual iron and manganese accumulations (fig. 33). The bog and turf iron-manganese ores are widespread across the western, south-western, and northern districts of the Ukraine (i.e. Cucuteni-Tripolye territory), especially in the basins of the Pripjat, Sana, W. Bug, and Dnestr Rivers and to a lesser extent across the Tarnopol, Černovtsi (Cernăuţi), and the Transcarpathian regions (Shnyukov and Orlovsky 1980). This is probably the most convenient source of both manganese and iron minerals for pigments in this region.

Table 5 Manganese-bearing minerals occurring in the Eastern Carpathians and Podolian Uplands

**Silicates**

| | |
|---|---|
| Rhodonite | $MnSiO_3$ |
| Pyroxmangite | $(Mn,Fe)SiO_3$ |
| Bustamite | $(Mn,Ca)SiO_3$ |
| Spessartine | $Mn_3Al_2Si_3O_{12}$ |
| Braunite | $3Mn_2O_3.MnSiO_3$ |
| Dannemorite | $(Fe,Mn,Mg)_7Si_8O_{22}(OH)_2$ |
| Knebellite | $(Fe,Mn)_2SiO_4$ |

**Carbonates**

| | |
|---|---|
| Rhodochrosite | $MnCO_3$ |
| Manganocalcite | $(Ca,Mn)CO_3$ |
| Manganosiderite | $(Mn,Fe)CO_3$ |

**Others**

| | |
|---|---|
| Alabandite | $MnS$ |

**Oxides**

| | |
|---|---|
| Manganite | $MnO(OH)$ |
| Pyrolusite | $MnO_2$ |
| Bixbyite | $Mn_2O_3$ |
| Hausmannite | $Mn_3O_4$ |
| Manganomelanes | variable |
| "Braunstein" | * |
| "Wad" | * |
| Jacobsite | $MnFe_2O_4$ |
| Vredenburgite | $3Mn_3O_4.2Fe_2O_3$ |

* See text for explanation.

Fig. 33 Age, location, and types of manganese deposits of the Ukraine (adjacent to or situated on Tripolye territory). Adapted from: Shnyukov and Orlovsky (1980)

| AGE | | | | | LOCATION | GENETIC CHARACTER | ORE-ENCLOSING ROCKS | ORE TYPE | MINERAL COMPOSITION |
|---|---|---|---|---|---|---|---|---|---|
| CAINOZOIC | Recent | | | | Western, southwestern, and northern districts of the Ukraine | sedimentary | Bog and alluvial deposits | oxides | Braunite,<br>Pyrolusite,<br>Psilomelane |
| | NEOGENE | Pliocene | Upper | | | | | | |
| | | | Middle | | | | | | |
| | | | Lower | | | | | | |
| | | Miocene | Upper | Meotian | | | | | |
| | | | | Sarmatian | | | | | |
| | | | Middle: Tortonian | | Region of Burštin, Rogatin, Khodorov, Ivano-Frankovsk | sedimentary | Limestones and argillaceous marls | oxides and carbonates | Vernadite,<br>Rhodochrosite,<br>Manganocalcite |
| | | | Lower: Poltavian | | | | | | |
| | PALEOGENE | Oligocene | Upper | | | | | | |
| | | | Lower | | | | | | |
| | | Eocene | Kievan | | District of Lvov, region of Dobromilov, Yamnaya-Dolnja village | sedimentary | Shales | carbonates | Carbonates of Iron and Manganese |
| | | | Buchakian | | Tismennitsa River | sedimentary | Sandstones | oxides and carbonates | Psilomelane and Rhodochrosite |
| | | Paleo-cene | Kanevian | | | | | | |

Fig. 33 (continued)

| | AGE | LOCATION | GENETIC CHARACTER | ORE-ENCLOSING ROCKS | ORE TYPE | MINERAL COMPOSITION |
|---|---|---|---|---|---|---|
| MESOZOIC | Cretaceous | Podolian Uplands | sedimentary | Limestones | oxides | Manganese Hydroxides |
| | Jurassic | | | | | |
| | Triassic | North part of the Rahovian massif (Rudarnia-Glimea River valley) | hydrothermal-exogenous | Zone of dislocations of Triassic conglomerates & red-brown sandstones | carbonates and oxides | Rhodochrosite and Rhodonite; Pyrolusite and Manganese Hydroxides in the oxide zone |
| PALEOZOIC | Permian | | | | | |
| | Carboniferous | Lvov-Volinsk Basin | sedimentary | Siderite and sidero-plesite concretions | carbonates | Manganese Carbonates |
| | Devonian | | | | | |
| | Silurian | | | | | |
| | Cambrian | | | | | |
| PROTERO-ZOIC | | Čivčin Carpathians | sedimentary-metamorphosed | Crystalline schist and gneiss | carbonates & oxides | Rhodochrosite-Rhodonite; Manganese oxides in oxide zone. |
| | | Rahov massif | infiltrated | Crystalline schist and limestone | oxides | Nests of Psilomelane with Pyrolusite veins |
| ARCHAEO-ZOIC | Teterev-Buggian suite | Hoščevatian deposit | Weathering crust | Crystalline limestones | oxides | Pyrolusite, Psilomelane with Iron Hydroxides |

One other source of manganese in northeastern Bulgaria should be mentioned. The manganese-bearing horizon runs parallel to the Black Sea in the Varna-Obrociste district which is part of the "Moesian Platform" (i.e., the Danube River plain of southern Romania and northern Bulgaria); these deposits consist mainly of primary carbonate manganese ores with oxide manganese ores formed by surface oxidation (Bogdanov 1982). While this manganese source could have had potential prehistoric exploitation, it lies too far to the south of the Cucuteni-Tripolye territory.

In conclusion, it is suggested here that only the oxides and hydroxides of manganese were used for the black and sometimes brown-black colour on Cucuteni-Tripolye ceramics. In addition, it is reasonable to assume that prehistoric potters used the powdery, black-brown masses of wad and bog ore which have been documented across the Ukraine, due to less time, distance, elevation, and effort in the procurement of ores. There is also the potential exploitability of the weathered surfaces of Eastern Carpathian manganese deposits, probably in the Bistriţa region. This region has not been intensively surveyed for Cucuteni-Tripolye settlements; however, map 11A shows the locations of known sites nearest to some of the Bistriţa manganese ore sources in the environs of Vatra Dornei. Although more surveying is needed, this map of sites, dating to all periods of the Cucuteni-Tripolye culture, at least indicates settlement during the Late Neolithic and Chalcolithic and therefore possible knowledge of manganese ore sources.

## III.B. Forming processes

Following the discussion on the raw materials available to ancient potters, the specific details of ceramic manufacturing will be presented here in two sections: 1) forming processes--which includes information on clay preparation, vessel formation, and decorative technology; and, 2) firing processes--which discusses the evolution and development of kiln technology, atmosphere control and temperature control.

Several sources of information were used in order to effect as complete a picture as possible of ceramic technology during the Pre-Cucuteni and Cucuteni periods. Archaeometric analyses were made on sherds which were obtained during overseas fieldwork. These analyses included petrography, X-ray fluorescence and X-ray diffraction for specific information on the mineralogical nature of the clays and clay preparation, the chemical composition of the paints, the mineralogical composition of the paints and the firing temperatures of the fine wares. Evidence on the use of the potter's wheel and pottery kilns is taken directly from the archaeological record. Published ethnographic material and an unpublished ethnographic interview gave interesting insight into types of fuels and raw materials for paints.

### III.B.1. Clay preparation

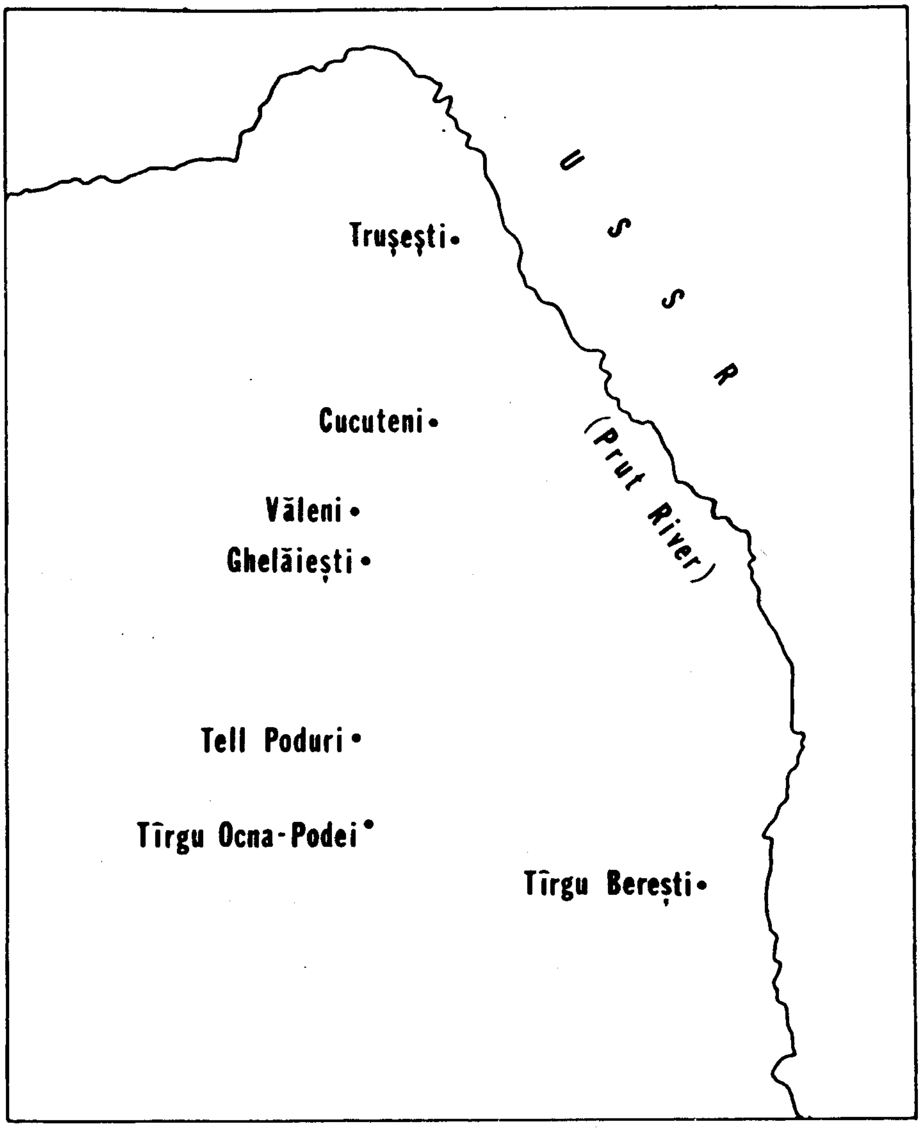
For information on choice of clays and techniques of clay preparation, petrographic thin sections were made of sherds from seven sites of the Cucuteni culture in eastern Romania (map 12) and microscopic analyses were conducted by the author.

Tables 6-18 list the results of the petrographic analyses of pottery dating from the Pre-Cucuteni II to the Cucuteni B periods. Based on these petrographic analyses and study of Romanian museum collections, several conclusions may be drawn. In general, highly ferruginous, micaceous clays were used, throughout the Pre-Cucuteni and Cucuteni sequence, which would fire either various shades of red in an oxidising atmosphere or black in a completely reducing atmosphere. Occasionally, exceptions are found, for instance a white clay was used during the Cucuteni B period at the site of Văleni. But the occurrence of clays with a high mica-micaceous schist content is reflective of the geology of the region, i.e. there are extensive mica-schist formations in the sub-Carpathians, the deposition of whose weathered materials contributed to the clay formation on the Moldavian Platform (cf. map 11 and section III.A.1).

The coarse fraction, which includes all natural inclusions in the clay but is used here to refer to quartz and feldspars only, is described both in terms of quantity of grains and average grain size. Two trends can be observed: During the Pre-Cucuteni period both a larger percentage of coarse fraction and a highly variable but larger average grain size are present in the clay matrix. During the later periods, both percentage of coarse fraction and average grain size decrease such that during the Cucuteni B period, ultra-fine clays were being used. At multi-level settlements (e.g., Văleni and Tell Poduri), several important conclusions may be made: Through time there is a consistent trend towards the use of clays with decreasing ratio of coarse fraction to clay matrix; this may derive from improved methods of clay refinement by the potters, the exploitation of different sources of clay in the immediate environs of the site, or both. In the case of Tell Poduri and Ghelăieşti, careful clay selection and improved refining are probably responsible for increased fineness of the later ceramics. At Tîrgu Ocna-Podei (Cucuteni B), the fineness of the clay paste is carried to the extreme: The clay has the lowest count of quartz/feldspar grains and one of the highest counts of mica of all samples analysed.

At Văleni, two different types of clay can be identified: During Pre-Cucuteni and Cucuteni A, a ferruginous (i.e., high iron-bearing) clay was used; and during Cucuteni B both a ferruginous clay and a lighter, almost white clay were used. The iron-bearing clay is probably a local clay, since its use was continuous during all three periods. A pure white clay occurs rarely in Romania--most light-coloured clays have some iron contamination, and contemporary potters who prefer light-coloured clays as slips for their products have to use either an off-colour clay or must purchase pure white clay through commercial distribution (Rotaru 1979:284). However, it is hypothesised that the light-coloured pottery at Valeni is of local manufacture also, since much white pottery of similar artistic style and decor is found at the site and not in the surrounding region.

Temper (i.e., additives to the clay by the pottery for the purposes of reducing clay shrinkage during drying and firing) was used consistently during the Pre-Cucuteni period and was composed of pulverized sherds or pottery fragments. However, with the advent of pre-fire painting of the pottery, there was a consistent abandonment of the use of any form of temper and Cucuteni potters appear to have manipulated their clays without the assistance of temper. Of all the Romanian museum collections



Map 12 Sites in NE Romania with analyzed ceramic samples

Tables 6-17 Petrographic analyses of Cucuteni pottery.

Explanatory note:

Standard petrographic thin sections (0.03 mm thick) were made from Cucuteni sherds ranging in date from Pre-Cucuteni II to Cucuteni B. The tables are organized approximately on the basis of chronology. A point count, or counting of individual mineral grains in the clay matrix, was made of the micas and the coarse fraction (all other rocks/minerals) in a 1 sq. mm area. Five areas were chosen at random and the results were averaged. The micas were counted separately, since all clays were found to be micaceous and the large quantities of mica would not give a meaningful point count if all fragments of rocks/minerals were included together. The point count does not include temper, only natural inclusions. The presence/absence of grain alignment, especially parallel alignment of mica sheets, was noted in order to detect the use of a rotational device (see text). Grain sizes are given in mm.

Abbreviations:

X = present
Tr = trace amount (less than 5 grains)
OX = oxidized throughout
RE = reduced throughout
IO = insufficient oxidation, presence of core
MG = mixed gases, uneven firing

Table 6

SITE: TELL PODURI
CULTURE/PERIOD: Pre-Cucuteni II (incised/excised wares)

| SAMPLE NO.: | POD II 1 | POD II 2 | POD II 3 |
|---|---|---|---|
| MINERAL FRAGMENTS | | | |
| Quartz | X | X | X |
| Feldspars: | | | |
| Ca/Na Plagioclase | X | X | X |
| Microcline | | | |
| Sanidine | | | |
| Epidote | | Tr | Tr |
| Biotite | | | X |
| Muscovite | X | X | X |
| Chlorite | | | |
| Opaques: | | | |
| Magnetite grains | X | X | |
| Haematite grains | | | |
| Haematite stain | | | X |
| Carbonates: | | | |
| Calcite | X | | |
| ROCK FRAGMENTS | | | |
| Chert | X | X | |
| Quartzite | | | |
| Schist | X | X | X |
| Granite | | | |
| QUANTITATIVE ANALYSIS | | | |
| Temper: | | | |
| Volume % | 5% | 5% | 6% |
| Average grain size | 2 | 2 | 2 |
| Coarse fraction: | | | |
| Point count | 15 ±3 | 40 ±5 | 24 ±5 |
| Average grain size | 0.25 | 0.2 | 0.3 |
| Micas: Point count | 110 ±9 | 50 ±10 | 45 ±8 |
| FORMING/FIRING METHODS | | | |
| Temper: | all samples: crushed sherds | | |
| Grain alignment: | none | none | none |
| Atmospheric conditions: | RE | RE | MG |

Table 7

SITE: TELL PODURI
CULTURE/PERIOD: Pre-Cucuteni III (incised/excised ware)

| SAMPLE NO.: | POD III 1 | POD III 2 | POD III 3 |
|---|---|---|---|
| **MINERAL FRAGMENTS** | | | |
| Quartz | X | X | X |
| Feldspars: | | | |
| Ca/Na Plagioclase | X | X | X |
| Microcline | | | |
| Sanidine | | | Tr |
| Epidote | | | |
| Biotite | | | |
| Muscovite | X | X | X |
| Chlorite | | | |
| Opaques: | | | |
| Magnetite grains | | X | |
| Haematite grains | | | |
| Haematite stain | X | | X |
| Carbonates: | | | |
| Calcite | X | X | |
| **ROCK FRAGMENTS** | | | |
| Chert | | | X |
| Quartzite | | | |
| Schist | X | X | X |
| Granite | | | |
| **QUANTITATIVE ANALYSIS** | | | |
| Temper: | | | |
| Volume % | 4% | 5% | 5% |
| Average grain size | 0.5 | 2 | 1 |
| Coarse fraction: | | | |
| Point count | 15 ±7 | 30 ±10 | 17 ±4 |
| Average grain size | 0.03 | 0.25 | 0.1 |
| Micas: Point count | 110 ±10 | 90 ±8 | 45 ±7 |
| **FORMING/FIRING METHODS** | | | |
| Temper: | all samples: crushed sherds | | |
| Grain alignment: | all samples: none | | |
| Atmospheric conditions: | MG | RE | OX |

## Table 8

SITE: TELL PODURI
CULTURE/PERIOD: Intermediate Pre-Cucuteni III-Cucuteni A

| SAMPLE NO.: | POD IN 1 | POD IN 2 | POD IN 3 |
|---|---|---|---|
| | (unpainted; | channeling; | util. wares) |
| MINERAL FRAGMENTS | | | |
| Quartz | X | X | X |
| Feldspars: | | | |
| Ca/Na Plagioclase | X | X | X |
| Microcline | | | |
| Sanidine | | | |
| Epidote | | | |
| Biotite | | | |
| Muscovite | X | X | X |
| Chlorite | | | |
| Opaques: | | | |
| Magnetite grains | X | | |
| Haematite grains | | | |
| Haematite stain | X | X | X |
| Carbonates: | | | |
| Calcite | | | |
| ROCK FRAGMENTS | | | |
| Chert | X | X | X |
| Quartzite | | | |
| Schist | X | X | X |
| Granite | | | |
| QUANTITATIVE ANALYSIS | | | |
| Temper: | | | |
| Volume % | 20% | 20% | 10% |
| Average grain size | 1 | 2 | 2 |
| Coarse fraction: | | | |
| Point count | 20 ±4 | 40 ±10 | 25 ±6 |
| Average grain size | 0.15 | 0.2 | 0.25 |
| Micas: Point count | 110 ±5 | 115 ±5 | 80 ±9 |
| FORMING/FIRING METHODS | | | |
| Temper: | all samples: crushed sherds | | |
| Grain alignment: | all samples: none | | |
| Atmospheric conditions: | IO | RE | MG |

Table 9

SITE: TELL PODURI
CULTURE/PERIOD: Cucuteni A

| SAMPLE NO.: | POD A 1 | POD A 2 | POD A 3 | POD A 4 |
|---|---|---|---|---|
| | (black) | (unpainted, utilitarian ware) | | (trichrome ware) |
| **MINERAL FRAGMENTS** | | | | |
| Quartz | X | X | X | X |
| Feldspars: | | | | |
| Ca/Na Plagioclase | X | X | X | X |
| Microcline | | | | |
| Sanidine | | | | X |
| Epidote | | | | |
| Biotite | X | X | | |
| Muscovite | X | X | X | X |
| Chlorite | | | | |
| Opaques: | | | | |
| Magnetite grains | X | | | |
| Haematite grains | | | | |
| Haematite stain | X | X | X | X |
| Carbonates: | | | | |
| Calcite | | X | | |
| **ROCK FRAGMENTS** | | | | |
| Chert | | | | |
| Quartzite | | | | |
| Schist | X | X | X | X |
| Granite | | | | |
| **QUANTITATIVE ANALYSIS** | | | | |
| Temper: | | | | |
| Volume % | 10% | 5% | 5% | none |
| Average grain size | 1 | 1.5 | 1.5 | |
| Coarse fraction: | | | | |
| Point count | 25 ±4 | 25 ±7 | 15 ±3 | 36 ±5 |
| Average grain size | 0.05 | 0.05 | 0.05 | 0.03 |
| Micas: Point count | 100 ±8 | 35 ±6 | 14 ±3 | 33 ±4 |
| **FORMING/FIRING METHODS** | | | | |
| Temper: | sherds | sherds | sherds | none |
| Grain alignment: | all samples: none | | | |
| Atmospheric conditions: | RE | MG | MG | OX |

## Table 10

SITE: TELL PODURI
CULTURE/PERIOD: Cucuteni AB and Cucuteni B

| SAMPLE NO.: | POD AB<br>(trichrome) | POD B<br>(monochrome) |
|---|---|---|
| MINERAL FRAGMENTS | | |
| Quartz | X | X |
| Feldspars: | | |
| Ca/Na Plagioclase | X | X |
| Microcline | | |
| Sanidine | | |
| Epidote | | |
| Biotite | | |
| Muscovite | X | X |
| Chlorite | | |
| Opaques: | | |
| Magnetite grains | Tr | |
| Haematite grains | X | |
| Haematite stain | X | X |
| Carbonates: | | |
| Calcite | | |
| ROCK FRAGMENTS | | |
| Chert | | Tr |
| Quartzite | | |
| Schist | X | X |
| Granite | | Tr |
| QUANTITATIVE ANALYSIS | | |
| Temper: | | |
| Volume % | none | none |
| Average grain size | | |
| Coarse fraction: | | |
| Point count | 7 ±1 | 11 ±2 |
| Average grain size | 0.02 | 0.1 |
| Micas: Point count | 37 ±8 | 12 ±3 |
| FORMING/FIRING METHODS | | |
| Temper: | none | none |
| Grain alignment: | none | none |
| Atmospheric conditions: | OX | OX |

Table 11

SITE: VĂLENI

CULTURE/PERIOD: Pre-Cucuteni III (incised ware)

| SAMPLE NO.: | VL P 1 | VL P 2 | VL P 3 | VL P 4 |
|---|---|---|---|---|
| MINERAL FRAGMENTS | | | | |
| Quartz | X | X | X | X |
| Feldspars: | | | | |
| Ca/Na Plagioclase | X | X | X | X |
| Microcline | | X | | X |
| Sanidine | | | | |
| Epidote | Tr | | | |
| Biotite | | | | |
| Muscovite | X | X | X | X |
| Chlorite | | | | |
| Opaques: | | | | |
| Magnetite grains | | X | | |
| Haematite grains | | | | |
| Haematite stain | X | X | X | X |
| Carbonates: | | | | |
| Calcite | X | | | X |
| ROCK FRAGMENTS | | | | |
| Chert | | | Tr | |
| Quartzite | | | | |
| Schist | | | | |
| Granite | | X | X | X |
| QUANTITATIVE ANALYSIS | | | | |
| Temper: | | | | |
| Volume % | 20% | none | 5% | none |
| Average grain size | 2 | | 2 | |
| Coarse fraction: | | | | |
| Point count | 35 ±7 | 21 ±3 | 30 ±5 | 20 ±6 |
| Average grain size | 0.2 | 0.2 | 0.2 | 0.1 |
| Micas: Point count | 9 ±4 | 5 ±2 | 10 ±4 | 5 ±2 |
| FORMING/FIRING METHODS | | | | |
| Temper: | sherds | none | sherds | none |
| Grain alignment: | all samples: none | | | |
| Atmospheric conditions: | RE | MG | MG | MG |

## Table 12

SITE: VǍLENI

CULTURE/PERIOD: Cucuteni A and Cucuteni B

| SAMPLE NO.: | VL A | VL B 2 | VL B 3 | VL B 4 | VL B 5 |
|---|---|---|---|---|---|
| | (trichrome ware) | (monochrome wares -----------) | | | |
| **MINERAL FRAGMENTS** | | | | | |
| Quartz | X | X | X | X | X |
| Feldspars: | | | | | |
| Ca/Na Plagioclase | X | X | X | X | X |
| Microcline | X | Tr | | | |
| Sanidine | | | | | |
| Epidote | | | | | |
| Biotite | | | | | |
| Muscovite | X | X | X | X | X |
| Chlorite | | | | | |
| Opaques: | | | | | |
| Magnetite grains | | | | | |
| Haematite grains | | X | X | X | |
| Haematite stain | X | | | | X |
| Carbonates: | | | | | |
| Calcite | | | | | |
| **ROCK FRAGMENTS** | | | | | |
| Chert | Tr | Tr | | | Tr |
| Quartzite | | | | | |
| Schist | X | | | | X |
| Granite | | | | | |
| **QUANTITATIVE ANALYSIS** | | | | | |
| Temper: | | | | | |
| Volume % | all samples: none | | | | |
| Average grain size | | | | | |
| Coarse fraction: | | | | | |
| Point count | 10±3 | 10±5 | 8±3 | 7±3 | 20±7 |
| Average grain size | 0.1 | 0.05 | 0.05 | 0.05 | 0.05 |
| Micas: Point count | 50±7 | 5±3 | 10±4 | 10±5 | 25±8 |
| **FORMING/FIRING METHODS** | | | | | |
| Temper: | all samples: none | | | | |
| Grain alignment: | none | none | present | present | present |
| Atmospheric conditions: | OX | OX | OX | OX | OX |

Table 13

SITE: TÎRGU BEREŞTI
CULTURE/PERIOD: Cucuteni A (trichrome ware)

| SAMPLE NO.: | BER A 1 | BER A 2 | BER A 3 |
|---|---|---|---|
| **MINERAL FRAGMENTS** | | | |
| Quartz | X | X | X |
| Feldspars: | | | |
| Ca/Na Plagioclase | X | X | X |
| Microcline | | | |
| Sanidine | | | |
| Epidote | | | |
| Biotite | | | |
| Muscovite | X | X | X |
| Chlorite | | | |
| Opaques: | | | |
| Magnetite grains | | | |
| Haematite grains | X | | |
| Haematite stain | X | X | X |
| Carbonates: | | | |
| Calcite | | | |
| **ROCK FRAGMENTS** | | | |
| Chert | Tr | | |
| Quartzite | | | |
| Schist | X | X | X |
| Granite | | | |
| **QUANTITATIVE ANALYSIS** | | | |
| Temper: | | | |
| Volume % | none | none | less than 2% |
| Average grain size | | | 0.5 |
| Coarse fraction: | | | |
| Point count | 8 ±3 | 15 ±3 | 8 ±3 |
| Average grain size | 0.02 | 0.01 | 0.02 |
| Micas: Point count | 30 ±10 | 40 ±10 | 7 ±3 |
| **FORMING/FIRING METHODS** | | | |
| Temper: | none | none | sherd fragments |
| Grain alignment: | none | none | none |
| Atmospheric conditions: | OX | OX | OX |

Table 14

SITE: TÎRGU BEREŞTI
CULTURE/PERIOD: Cucuteni A (unpainted, red paste, utilitarian ware)

| SAMPLE NO.: | BER A 4 | BER A 5 |
|---|---|---|
| **MINERAL FRAGMENTS** | | |
| Quartz | X | X |
| Feldspars: | | |
| Ca/Na Plagioclase | X | X |
| Microcline | | |
| Sanidine | Tr | |
| Epidote | | |
| Biotite | | |
| Muscovite | X | X |
| Chlorite | | |
| Opaques: | | |
| Magnetite grains | | |
| Haematite grains | | |
| Haematite stain | X | X |
| Carbonates: | | |
| Calcite | | |
| **ROCK FRAGMENTS** | | |
| Chert | X | Tr |
| Quartzite | | |
| Schist | X | X |
| Granite | Tr | |
| **QUANTITATIVE ANALYSIS** | | |
| Temper: | | |
| Volume % | none | none |
| Average grain size | | |
| Coarse fraction: | | |
| Point count | 25 ±7 | 8 ±3 |
| Average grain size | 0.1 | 0.25 |
| Micas: Point count | 35 ±8 | 90 ±10 |
| **FORMING/FIRING METHODS** | | |
| Temper: | none | none |
| Grain alignment: | both: none, poorly sorted coarse fraction | |
| Atmospheric conditions: | OX | OX |

Table 15

SITE: GHELĂIEŞTI

CULTURE/PERIOD: Cucuteni A

| | | |
|---|---|---|
| SAMPLE NO.: | GH A 1 (unpainted, util. ware) | GH A 2 (trichrome ware) |
| **MINERAL FRAGMENTS** | | |
| Quartz | X | X |
| Feldspars: | | |
| Ca/Na Plagioclase | X | X |
| Microcline | | |
| Sanidine | | |
| Epidote | | Tr |
| Biotite | | |
| Muscovite | X | X |
| Chlorite | X | X |
| Opaques: | | |
| Magnetite grains | X | |
| Haematite grains | | |
| Haematite stain | X | X |
| Carbonates: | | |
| Calcite | | |
| **ROCK FRAGMENTS** | | |
| Chert | X | |
| Quartzite | | |
| Schist | X | X |
| Granite | Tr | Tr |
| **QUANTITATIVE ANALYSIS** | | |
| Temper: | | |
| Volume % | 10% | none |
| Average grain size | 2 | |
| Coarse fraction: | | |
| Point count | 12 ±5 | 15 ±5 |
| Average grain size | 0.02 | 0.1 |
| Micas: Point count | 94 ±10 | 47 ±5 |
| **FORMING/FIRING METHODS** | | |
| Temper: | crushed sherd | none |
| Grain alignment: | none | none |
| Atmospheric conditions: | RE | OX |

Table 16

SITE: GHELĂIEŞTI

CULTURE/PERIOD: Cucuteni AB and Cucuteni B (monochrome wares)

| SAMPLE NO.: | GH AB 1 | GH AB 2 | GH B |
|---|---|---|---|
| **MINERAL FRAGMENTS** | | | |
| Quartz | X | X | X |
| Feldspars: | | | |
| Ca/Na Plagioclase | X | X | X |
| Microcline | | | |
| Sanidine | | | |
| Epidote | | | |
| Biotite | | | |
| Muscovite | X | X | X |
| Chlorite | X | X | X |
| Opaques: | | | |
| Magnetite grains | | | |
| Haematite grains | | | |
| Haematite stain | X | X | X |
| Carbonates: | | | |
| Calcite | | | |
| **ROCK FRAGMENTS** | | | |
| Chert | X | X | |
| Quartzite | | | |
| Schist | X | X | X |
| Granite | | | |
| **QUANTITATIVE ANALYSIS** | | | |
| Temper: | | | |
| Volume % | none | none | none |
| Average grain size | | | |
| Coarse fraction: | | | |
| Point count | 17 ±3 | 17 ±4 | 8 ±3 |
| Average grain size | 0.1 | 0.1 | 0.01 |
| Micas: Point count | 45 ±5 | 45 ±5 | 112 ±8 |
| **FORMING/FIRING METHODS** | | | |
| Temper: | none | none | none |
| Grain alignment: | strong alignment in all samples | | |
| Atmospheric conditions: | OX | OX | OX |

Table 17

SITE: TÎRGU OCNA-PODEI

CULTURE/PERIOD: Cucuteni B (monochrome ware)

| SAMPLE NO.: | TO B 1 | TO B 2 |
|---|---|---|
| **MINERAL FRAGMENTS** | | |
| Quartz | X | X |
| Feldspars: | | |
| Ca/Na Plagioclase | X | X |
| Microcline | | |
| Sanidine | | |
| Epidote | | |
| Biotite | | |
| Muscovite | X | X |
| Chlorite | | |
| Opaques: | | |
| Magnetite grains | | |
| Haematite grains | | |
| Haematite stain | X | X |
| Carbonates: | | |
| Calcite | | |
| **ROCK FRAGMENTS** | | |
| Chert | | |
| Quartzite | | |
| Schist | X | X |
| Granite | | |
| **QUANTITATIVE ANALYSIS** | | |
| Temper: | | |
| Volume % | none | none |
| Average grain size | | |
| Coarse fraction: | | |
| Point count | 3 ±3 | 4 ±3 |
| Average grain size | 0.02 | 0.02 |
| Micas: Point count | 105 ±10 | 109 ±10 |
| **FORMING/FIRING METHODS** | | |
| Temper: | none | none |
| Grain alignment: | present | good alignment |
| Atmospheric conditions: | OX | OX |

Table 18 Petrographic analysis of sherds from the sites of Cucuteni and Truşeşti (from: Ellis 1980).

| Sample Number | Period (Cucteni) | Size Range for Inclusions (mm) | Quartz | Twinned and Untwinned Feldspar | Muscovite | $CaCO_3$ (Inorganic) | $CaCO_3$ (Organic) | Haematite | Magnetite | Chert | Granite | Schist | Sherd Fragments |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Pre-Cuc. | .1-2.0 | X | X | X | X |  | X | X | X |  |  | X |
| 2 | A | .01-.1 | X | X | X |  |  | X | X | X |  | X |  |
| 3 | A | .01-.1 | X | X | X |  |  | X | X |  |  | X | X |
| 5 | A | .01-.1 | X | X | X |  |  | X | X | X |  |  | X |
| 6 | B | .01-.05 | X | X | X |  |  | X | X | X |  |  |  |
| 7 | B | .01-.1 | X | X | X |  |  | X | X | X | X |  |  |
| 8 | B | .01-.1 | X | X | X |  |  | X | X | X |  |  |  |
| 9 | "C" | .03-2.0 | X | X | X |  | X |  | X | X |  |  |  |
| 10 | "C" | .01-2.0 | X | X | X |  | X |  | X | X |  |  |  |

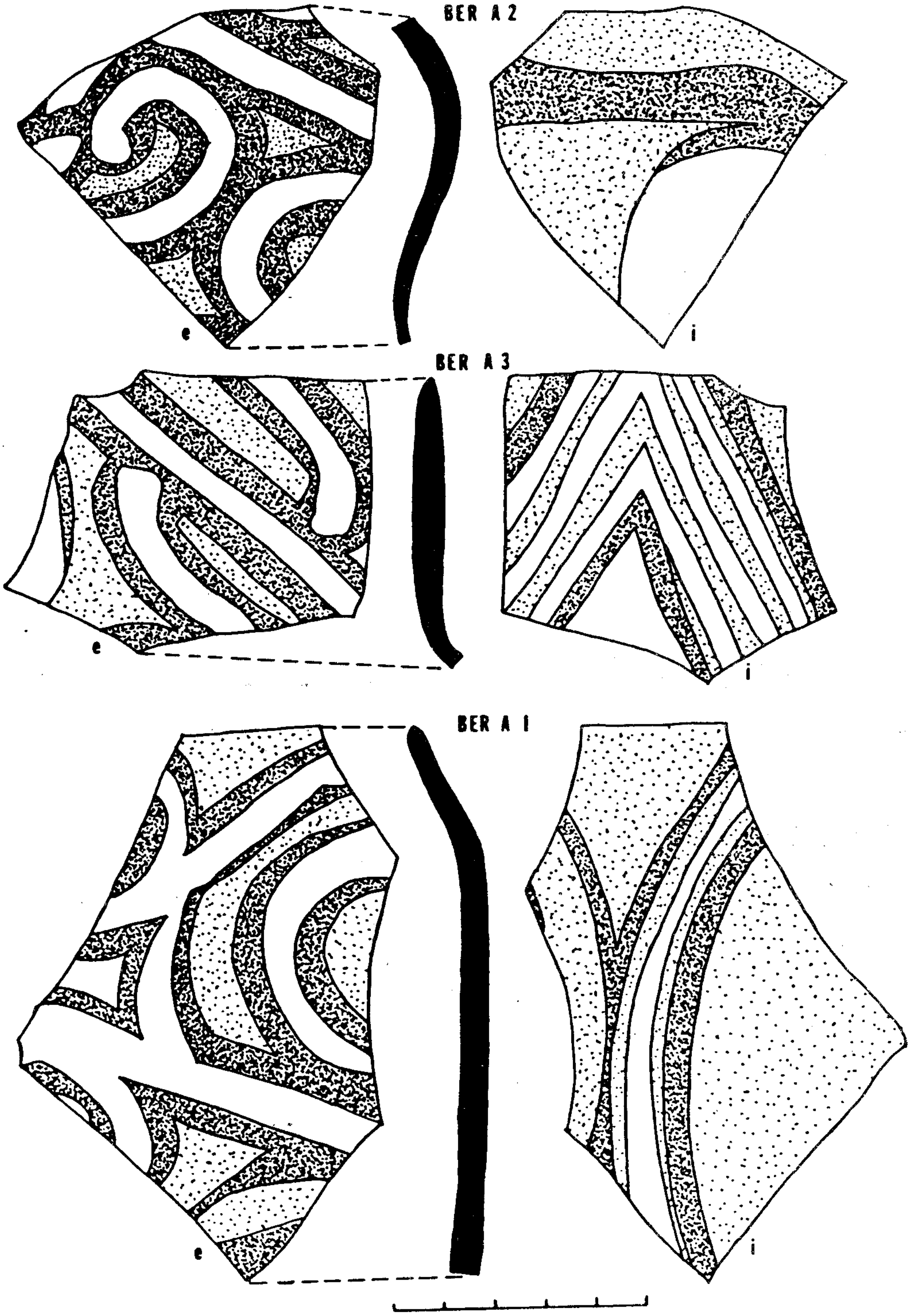


Fig. 34 Cucuteni A samples from Tîrgu Bereşti. (Heavy stippling-black, light stippling-red, blank-white.) For figs. 32-36: e = exterior surface, i = interior surface, all scales in cm.

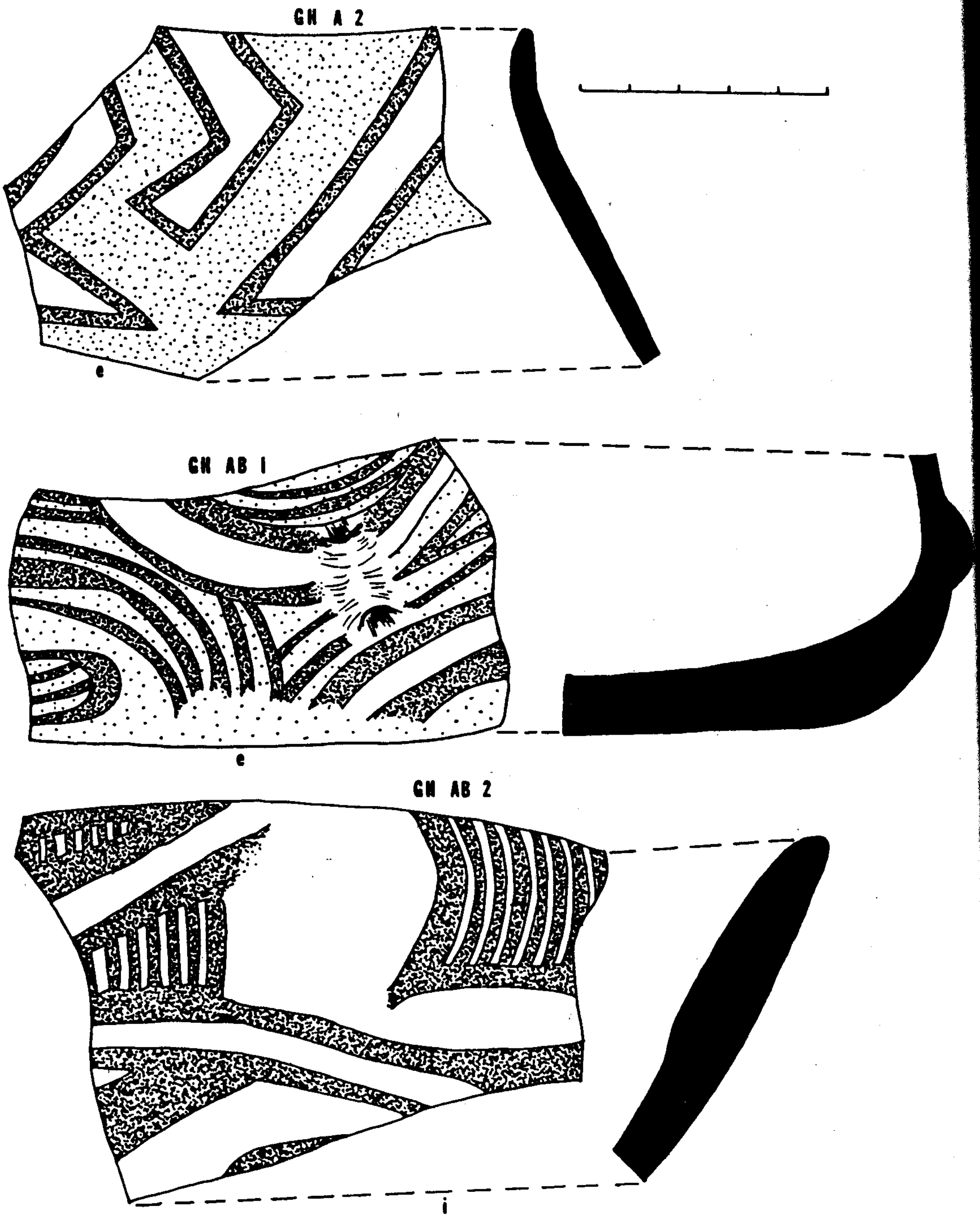


Fig. 35 Cucuteni A and AB samples from Ghelăieşti.
GH A 2: black, red, white
GH AB 1: black and white on clay
GH AB 2: black on clay

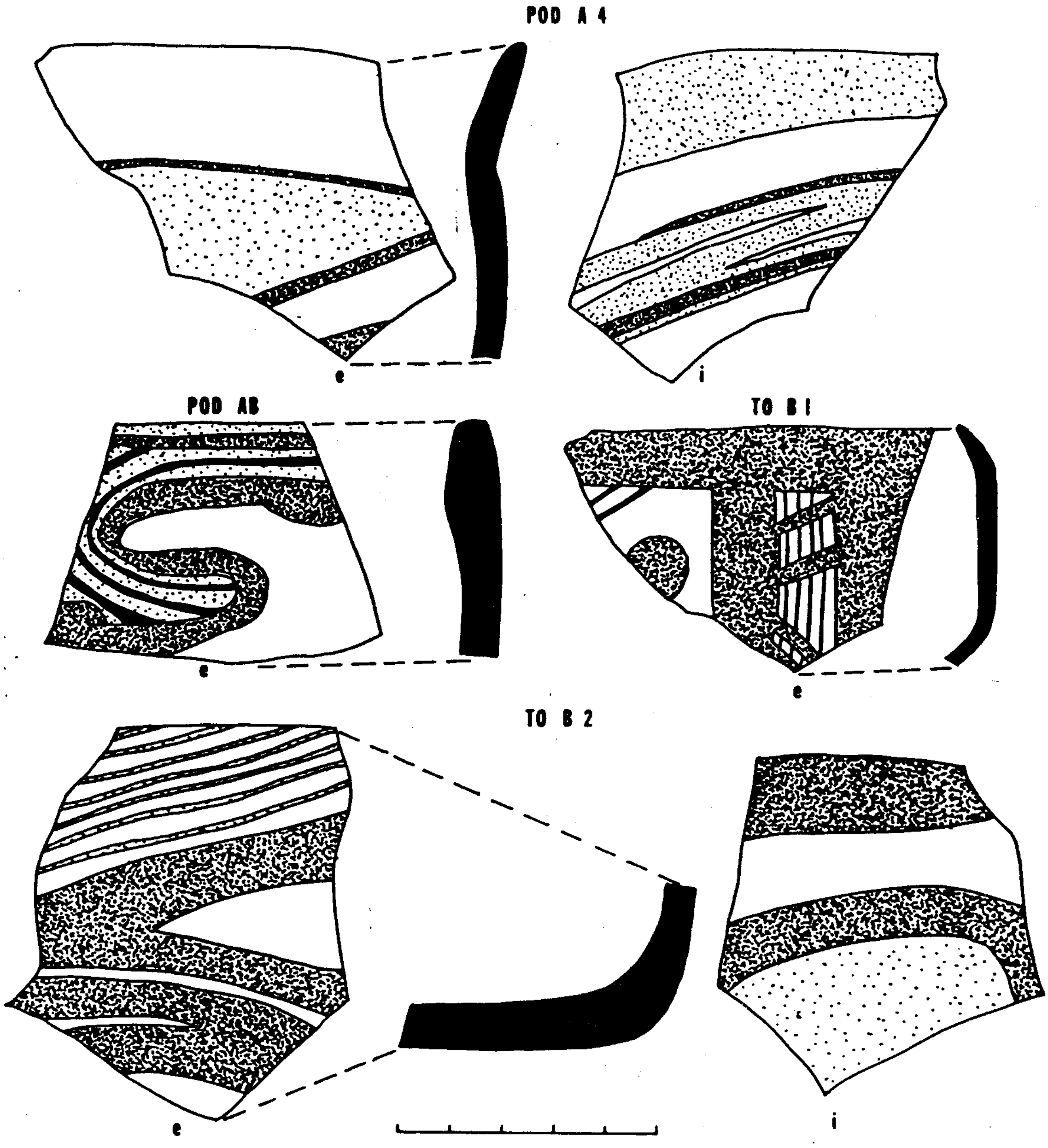


Fig. 36 Cucuteni A and AB samples from Tell Poduri and Cucuteni B samples from Tîrgu Ocna-Podei.
POD A 4 and POD AB: black, red, white
TO B 1: black on clay
TO B 2: black and red on clay

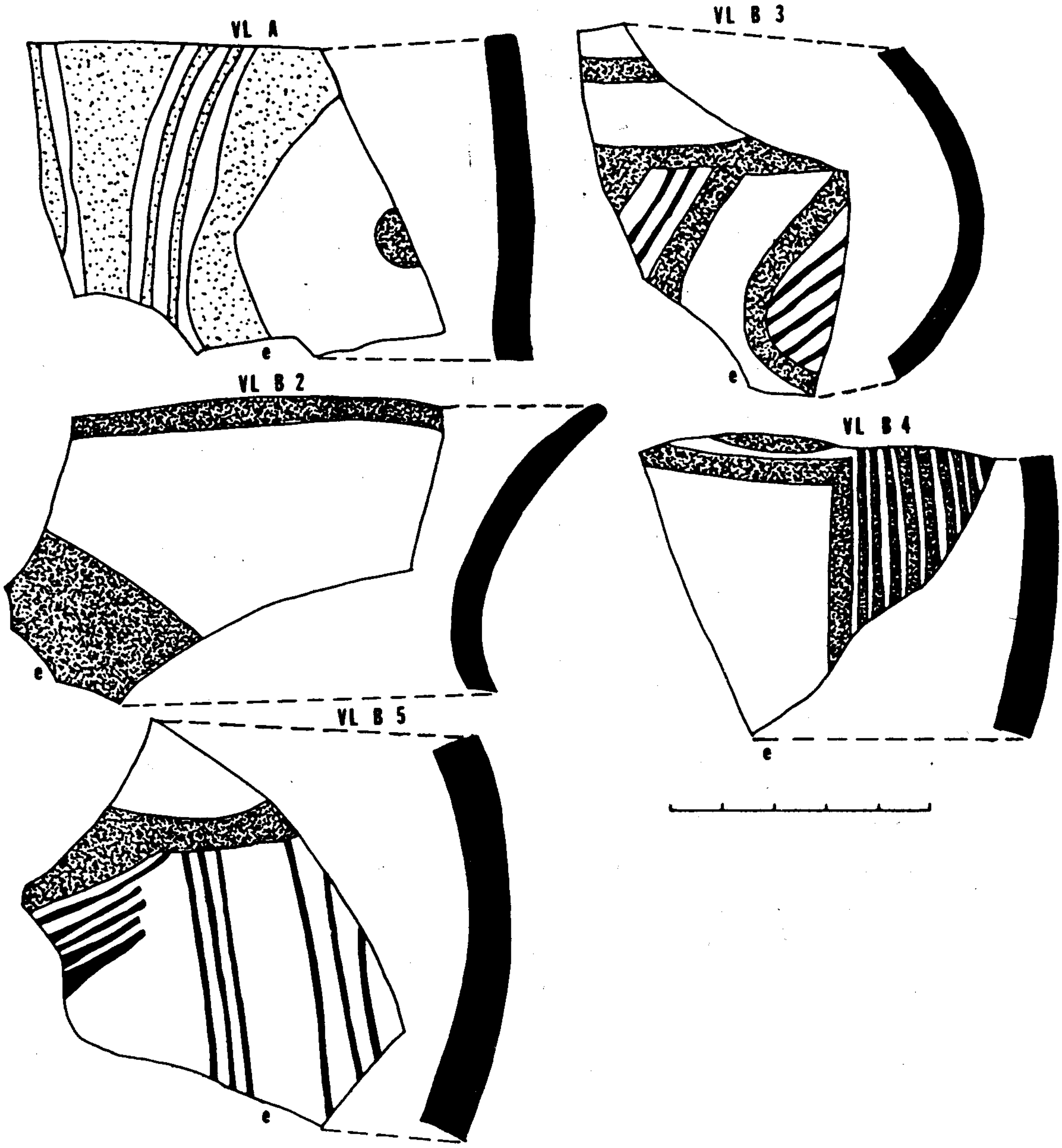


Fig. 37 Cucuteni A and B samples from Vǎleni.
VL A: black, red, white
all others: black on clay

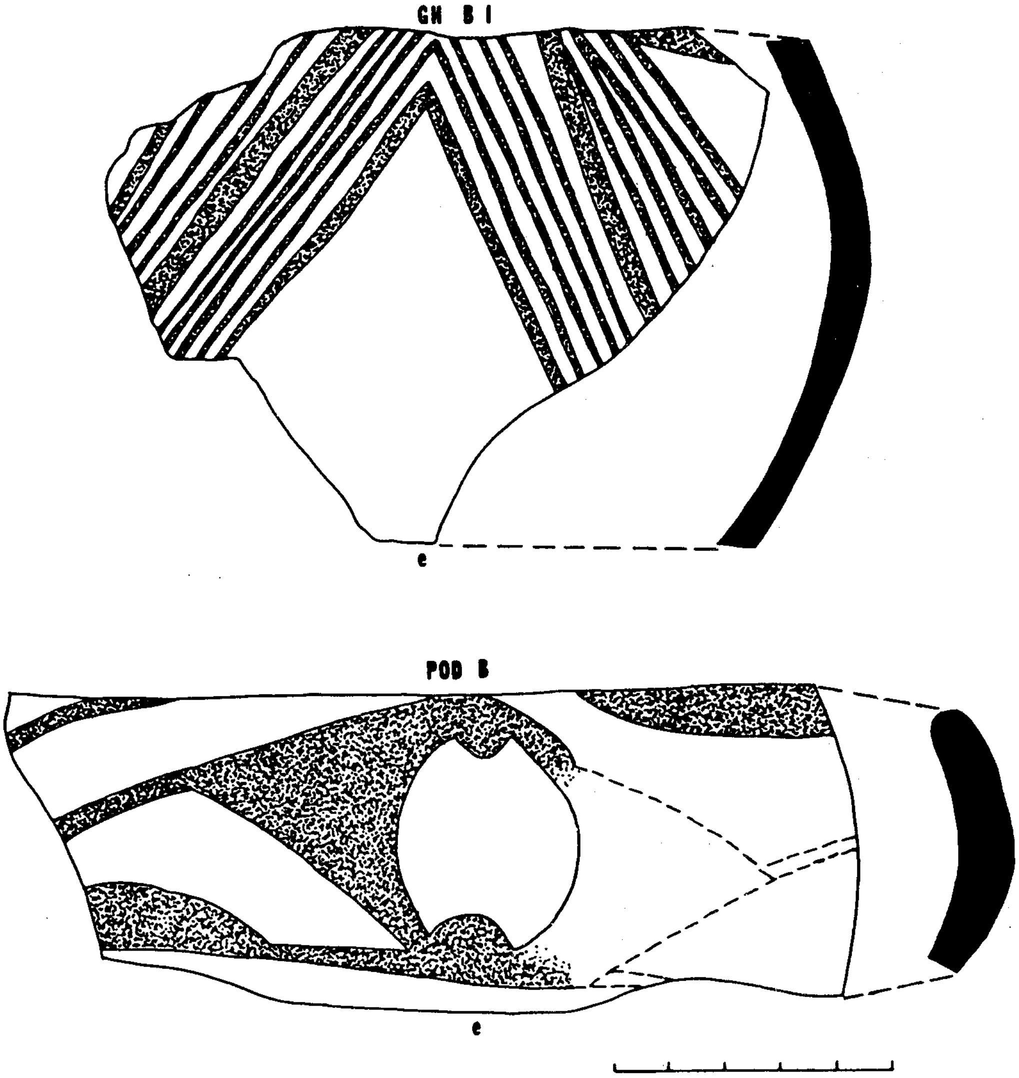


Fig. 38 Cucuteni B samples from Ghelăieşti and Tell Poduri.
GH B 1 and POD B: black on clay

studied, less than two dozen examples of painted pottery with temper were encountered and during the painted-ware sequence, only unpainted (oxidised) utilitarian ware and the foreign "Type C" ware contained crushed sherd or clam shell tempers, respectively. Upon visual inspection, the reason for the abandonment of temper in painted wares became apparent: The inclusion of crushed sherds, for instance, inhibited surface polishing and seriously interfered with the aesthetic qualities of the surface decoration. Petrographic analyses confirm the absence of sherds and any other kinds of temper (cf. tables 6-18; and Ellis 1980). The petrographic thin sections were carefully studied for the presence of pulverized rock, sand or other materials which may have been intentionally added to the clay. The mineral inclusions in the ceramics were identified, counted, and measured in order to determine whether these inclusions were natural to the clay or were mixed into the clay by the potters. It is concluded that the mineral inclusions are natural and do not constitute "temper". Several observations support this conclusion: First, the samples from Văleni, Tell Poduri, and other multi-level settlements which span all periods from Pre-Cucuteni to Cucuteni B, show the same basic mineralogical composition which indicates that when the use of sherd temper was abandoned there was no sudden increase in the amount of pulverized rock or other substances--in fact to the contrary, and this is most intriguing, the technological trend show that these natural coarse inclusions steadily decline through time. Pottery from the Cucuteni B period is exemplary for its fineness, i.e. the very small quantities of quartz-feldspar inclusions (cf. the samples from Tîrgu Ocna-Podei). This decreasing volume of coarse material in the clay matrix may be indicative of levigation of clays and/or the more careful selection of clays by empirical observation. Although this hypothesis cannot be proven, some partial support of the idea of clay refining or levigation may be found from the samples from Bereşti which show a dichotomy between the fine painted ware and the unpainted utilitarian ware--both having a well oxidised, well fired red-orange paste, but the average grain size of quartz-feldspar inclusions varied considerably--0.02 mm for painted ware and 0.1-0.25 mm for unpainted ware--possibly indicating some clay levigation which would be able to sort out the coarser fragments. On this same problem, V. G. Childe (1923:268) had also remarked from surface inspections that carefully levigated clays were being used at Schipenitz which dates to Cucuteni B.

The question may very well be asked, how were the Cucuteni potters able to work and manipulate their clays and, more importantly, control the problem of clay shrinkage during the drying and firing of vessels without the addition of temper? As was previously mentioned, the clays used to manufacture Cucuteni pottery had a very high mica content. The geology of the Moldavian Platform indicates that residual clays were formed from the deposition of weathered material from the Eastern Carpathians during the Miocene transgressions of the Black Sea (cf. section III.A.1). The parent rock, from which these residual clays derive, include extensive mica-schist formations and therefore the considerable quantity of mica and schist in these ceramics is natural to the clay. But, more important is the potential effect of these mica inclusions on the behaviour of the clay. It is suggested here that the micaceous clays needed no added temper and that the high mica content together with the other natural inclusions sufficed to prevent extensive clay shrinkage and subsequent cracking. Other scholars have noted this same quality of micaceous clays in other parts of the world (Shepard 1956:162).

What is interesting is when the Cucuteni potters realised that their available clays could behave in an acceptable manner without the addition of temper. During the Pre-Cucuteni period, there is a consistent use of crushed sherds as temper, and occasional but quite rare pieces of Cucuteni A trichrome ware have been found to contain crushed sherds. Therefore, it is with the advent of a new decorative technology, i.e. pre-fire painting, and the concomitant change in cultural aesthetics of such surface-embellished pottery which brought about these changes. Also noteworthy is the relative uniformity of these technological changes across space. Part of this uniformity is obviously due to the types of clays available to and chosen by the craftspersons. Secondly, intersite communication--through the movement of people and/or ideas--had to have been at its optimum level during the transition from the manufacture of incised/excised ware to that of painted ware.

### III.B.2. Vessel formation

During all phases of the incised/excised and painted wares, pottery was hand-built using the coil method (cf. Hołubowicz 1947; Markevič 1981). However, during the Cucuteni AB (=Tripolye B II) and Cucuteni B (=Tripolye C I) periods, there is both direct and indirect evidence of the invention and use of a rotational device in combination with the coil method.

The direct evidence of rotary motion in ceramic production comes from building no. 3--which was used exclusively for pottery production--at the site of Varvarovka VIII in Soviet Moldavia (Markevič 1981:127). Inside the workshop, a wooden post was found wedged into the ground to a depth of 50-55 cm. This post with a diameter of 36-38 cm was packed with clay mixed with chaff. A ring of clay and chaff for reinforcement, with a 12-13 cm rim and standing 5 cm above the ground, surrounded the post (fig. 39:3). Since this feature was discovered inside the pottery workshop (cf. section III.D.), Markevič has assumed that it played a role in vessel formation and has offered several reconstructions of methods of rotation (fig. 39:2, 5, 6). Additional evidence comes from the locus at Varvarovka XV: Here a sandstone slab with two holes, one of which was very well preserved with a diameter of 45 mm, was found (Markevič 1981:129-130). The hole shows clear indications of rotary motion and the sandstone slab is believed to have served as a base for a pivoted turntable or simple wheel (fig. 39:1, 4, 7). There is no other published direct proof for a simple form of the potter's wheel, since the necessary evidence could be overlooked quite easily during excavations. V. Markevič has been the first to have documented such finds for the Cucuteni-Tripolye culture.

The indirect evidence of the use of rotary motion in pottery manufacturing may be observed from 1) marks on the pottery itself, 2) the standardisation of vessel forms at each site, and 3) the strong alignment of natural, especially micaceous, inclusions in the clay. Markevič (1981:130) has noted horizontal and parallel striations on the interior of pottery from Soviet Moldavia belonging to the Tripolye C period. In addition to these interior markings, some complete vessels

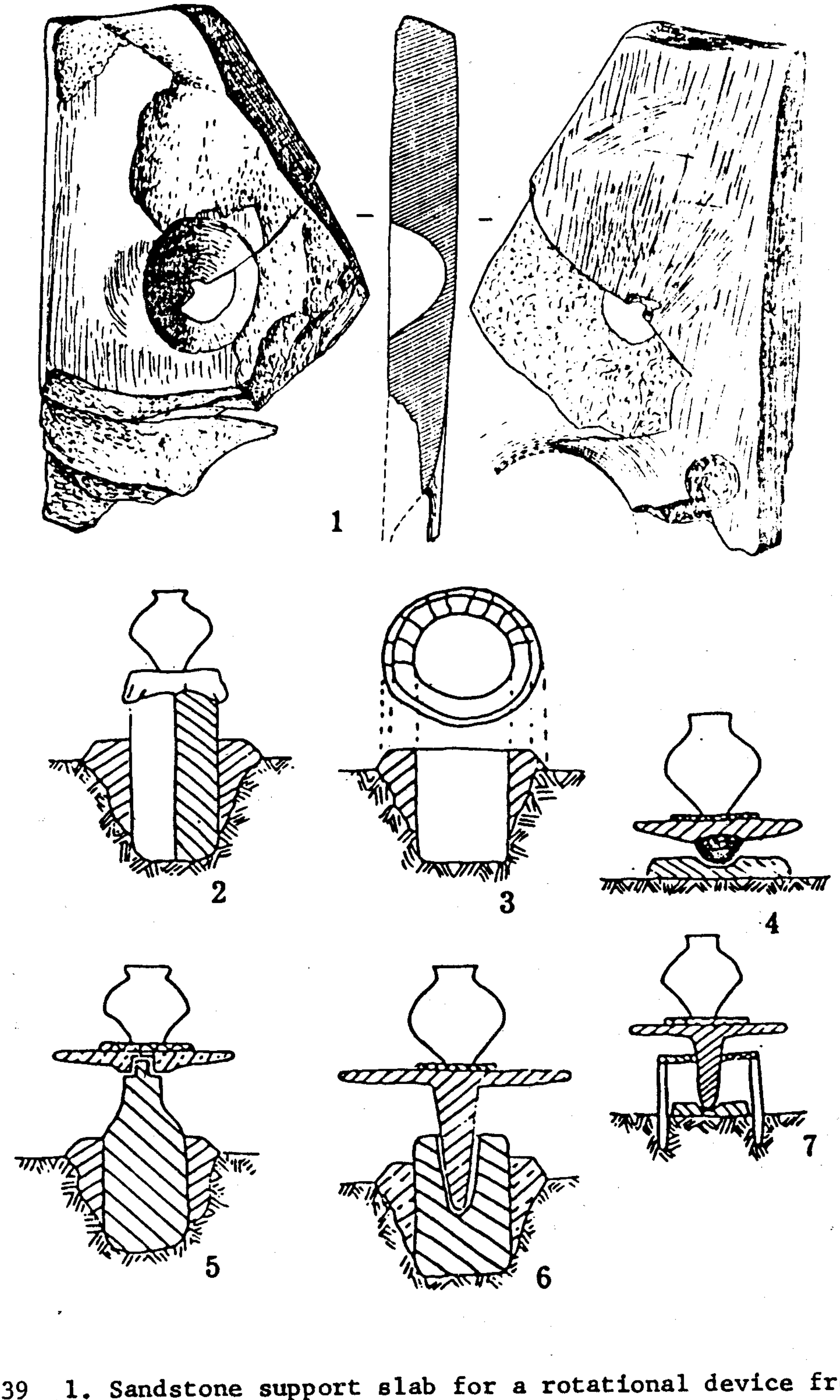


Fig. 39 1. Sandstone support slab for a rotational device from Varvarovka XV; 4. reconstruction of turntable after (1); 7. reconstruction of a simple wheel with support slab after (1); 3. remains of the foundation for a pottery wheel from Varvarovka VIII; 2,5,6. possible variants for reconstructing vessel-forming devices from Varvarovka VIII after (3).

have circular string imprints on the base (Markevič 1981:130, no illustrations).

During the later periods of the Cucuteni-Tripolye culture, the variety of ceramic forms decreases while vessel standardisation and vessel symmetry increase, such that at many settlements an entire series of vessels may show almost identical shape and size; this is especially true of the large biconical vases (cf. chapter IV). This vessel standardisation is nowhere more apparent than at Varvarovka VIII where nine sphero-conical vessels were found in a niche in the pottery workshop (Markevič 1981:128).

More definitive indirect proof of the use of rotary motion in ceramic production can be seen through the examination of petrographic thin sections of the pottery itself. The presence of large numbers of longitudinal flakes of mica in the clay fabric was of enormous aid in ascertaining grain alignment and therefore the use of rotary motion, especially in sherds from the Cucuteni B period but also during Cucuteni AB. In the Cucuteni B samples from Văleni and Tîrgu Ocna-Podei, parallel grain alignment could be readily observed in thin section at 100x. The samples from Ghelăieşti, dating to both Cucuteni AB and B, showed the strongest alignment of mica grains of any of the samples studied, which indicates that rotary motion was definitely used for an extensive period of time beginning with the Cucuteni AB period.

G. Foster (1959) and A. Rieth (1960) have detailed at length the development of the potter's wheel. Foster (1959:103-109) has outlined the following four types of rotary motion in ceramic production: 1) the unpivoted turntable in the form of a clay saucer or a wooden disc that turns; 2) the pivoted turntable or "tournette" which consists of a disc, usually of wood, with a socket on the underside that is balanced on a fixed boss or pivot; 3) the simple wheel which takes on a great variety of forms and consists of a head of sufficient weight and proportions as to allow sufficient momentum to permit the "throwing" of a pot after the application of force, usually by means of a stick; in some forms there is a socket in the underside of the wheel into which a fixed non-revolving pivot projects; in another form, the pivot is fixed into the underside of the wheel and the wheel and pivot revolve together; and finally, 4) the "double" or "kick" wheel which is characterised by two horizontal discs joined by a verticle axle, supported at the base by a thrust bearing or a simple depression in a stone. Rieth has documented a similar line of wheel development and has produced a generalised evolutionary scheme from an immense variety of ethnographical and historical forms of rotational devices (Rieth 1960: fig. 126, reproduced here as fig. 40).

Petrographic analysis of Romanian pottery (vide supra) has shown that some form of rotary motion was employed beginning with the Cucuteni AB (=Tripolye B II) period and definitely on a wider scale during Cucuteni B (=Tripolye C I). Based on the limited, but promising, evidence from Soviet Moldavia, Cucuteni-Tripolye potters used a pivoted turntable and probably even a socketed and/or unsocketed form of the simple wheel. However, it is important to note that the use of some form of rotating disc, turntable, or wheel does not preclude the use of other hand-building techniques such as the use of coils and molding:

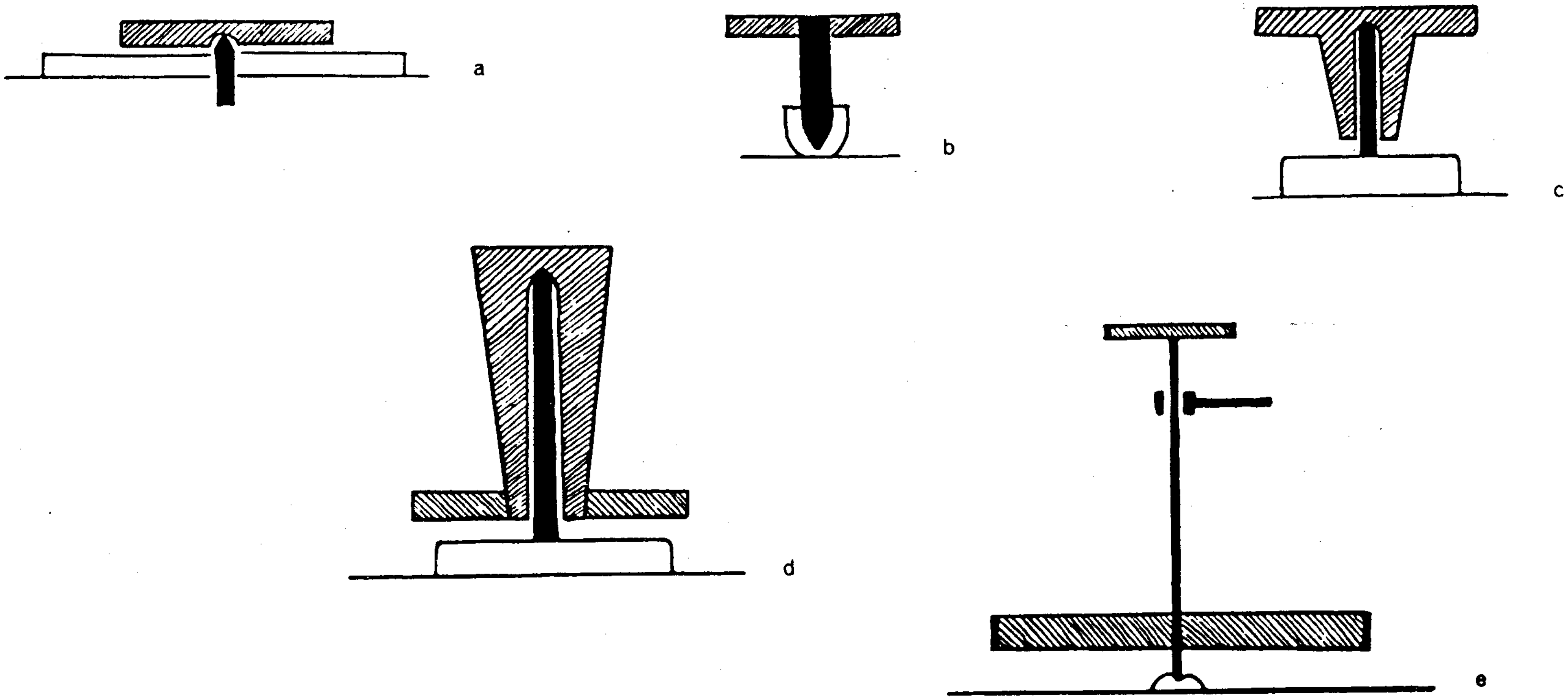


Fig. 40 Evolution of rotational devices in pottery-making (see text).

As Foster (1959:102) has stated, "Pottery-making is most accurately thought of as a continuum from hand modeling to full exploitation of the wheel, with innumerable intermediate gradations."

### III.B.3. Decoration

The techniques of surface decoration of Cucuteni-Tripolye pottery may be characterised as follows: 1) modification of the clay surface itself through incising, excising (the removal of clay from the surface to produce a design in relief), channeling (i.e. long, smooth furrows), impressing, and polishing; 2) the application of one, two or three mineral-based slips which consist of a clay-water suspension, with powdered minerals as pigments, used either to cover completely the surface of the unfired object or to produce decorative patterns on the unfired clay surface; or 3) any combination of both (1) and (2).

The use of a white powder (i.e., calcium carbonate) to fill the spaces produced by excising, as well as the application of red ochre (i.e. haematite)--both post-firing techniques--is documented during the Pre-Cucuteni II phase (Marinescu-Bîlcu 1974:67-68). The use of a slip is not attested until Pre-Cucuteni III, and a rare pre-fire white slip appears during late Pre-Cucuteni III (Marinescu-Bîlcu 1974:75, 77).

In the contact zone in central and southeastern Transilvania between the Petreşti and the early Cucuteni cultures, there is an attempt on the part of Cucuteni potters to imitate the Petreşti pre-fire painted ware--especially in terms of producing red and black on the same vessel. Petreşti potters had already known for a long time that in order to effect simultaneous red and black colours using mineral pigments and applied before firing in an oxidising atmosphere, one could not use solely an iron oxide, which would at best produce a dark brown colour (in an atmosphere of mixed gases) or would turn to various shades of red in an oxygen-rich atmosphere. Manganese and ferromanganese oxides whose colours--black and brown-black, respectively--are stable in all firing conditions solved the problem of producing black and therefore a multi-coloured surface. However, in imitation of this technique, Cucuteni potters in southeastern Transilvania had produced the color black by firing the vessel in a completely reducing (i.e., CO-rich) atmosphere and then proceeded, as earlier tradition dictated, with the post-fire application of powdered haematite for a rich red colour.

Therefore, three important innovations in decorative technology took place at the beginning of the Cucuteni-Tripolye painted ware sequence: 1) a mastery over gaseous conditions during firing, both in reduction (which produced a completely black clay matrix) and in oxidation (which produced a clay matrix in various shades of red) as opposed to the uncontrolled atmosphere in the firing of Pre-Cucuteni ceramics (cf. section III.C.2); 2) the recognition in nature of the existence of materials (i.e., manganese-bearing minerals) which could remain black in an oxidising atmosphere; and, 3) the technique of producing a paint in a water and clay suspension ("slip") which would serve to affix the colour to the unfired clay surface.

Chemical analysis of the slips on Cucuteni-Tripolye ceramics in order to identify raw materials was first accomplished by I. Krasnikov

(1931) on sherds from the eponymous site of Tripolye near Kiev--a study which has largely been forgotten for almost 50 years. Such technical studies were revived through physico-chemical analysis of coloured slips on sherds from the eponymous site of Cucuteni and also from Truşeşti in northeastern Romania (Ellis 1980). Sherds from the Late Tripolye site of Bilcze Zlote have also been analysed recently (Stos-Gale and Rook 1981). In addition to the foregoing, results of X-ray fluorescence and X-ray diffraction analyses of sherds from five additional sites in Romania (Vǎleni, Ghelǎieşti, Tell Poduri, Tîrgu Ocna-Podei, Tîrgu Bereşti) are offered here. Technical details of instrumentation used to conduct the analyses are given in the caption to figures 41-46 and table 19.

Various forms of iron oxide were universally used in the Cucuteni-Tripolye zone for the red slip. Analyses by Krasnikov (1931), Ellis (1980; and fig. 44, table 19 this work), and Stos-Gale and Rook (1981) have confirmed that haematite ($Fe_2O_3$) is the remaining pigment on Cucuteni-Tripolye ceramics. However, as specified in the section on the geology of raw materials (III.A), a variety of hydrated iron oxides or iron hydroxides could have been used--haematite, goethite, or limonite--which may appear in nature in shades of red, brown, or yellow. Upon heating, absorbed water is immediately driven off and goethite becomes haematite; at higher temperatures of $400^\circ$-$600^\circ$C chemically bonded water is lost and amorphous forms of ferric oxide (i.e. limonite) become crystalline, again yielding haematite. Fig. 44 shows a typical spectrum for a red slip containing haematite.

The white slip on Cucuteni-Tripolye pottery may appear as white or with various nuances of yellow or pink due to iron impurities in the clay-based slip. Cucuteni-Tripolye potters had produced a white slip in two different ways: At the sites of Cucuteni and Truşeşti calcium carbonate was put into a clay slip and through the process of firing, a calcium silicate ($CaO.SiO_2$) had formed (Ellis 1980). At the sites of Tripolye (Krasnikov 1931) and Bilcze Zlote (Stos-Gale and Rook 1981), a light coloured kaolin clay had been used to produce a white or cream colour. On the samples from Tell Poduri, Vǎleni and Bereşti, light-coloured clays were also used. At Tell Poduri and Vǎleni, a very good white slip was effected, whereas at Bereşti the light coloured slip was a dark pink with very little contrast in relation to the clay surface.

The methods of producing black on prehistoric ceramics have already been mentioned in this section. The presence of manganese and manganese-bearing minerals in the black slips on Cucuteni-Tripolye ceramics has been documented in the eastern (Krasnikov 1931), western (Ellis 1980; and this work) and northern (Stos-Gale and Rook 1981) regions of this culture. It is noteworthy that manganese oxides are still used today for decorating ceramics in eastern Romania and are derived from the Bistriţa River region manganese deposits (map 11) which borders the Cucuteni-Tripolye zone (Rotaru 1980:275).

There is a great variety of minerals found in the black slips of Cucuteni-Tripolye ceramics. From the sites of Cucuteni and Truşeşti, bixbyite and jacobsite were detected (Ellis 1980). At Bilcze Zlote, bixbyite, jacobsite, hausmannite, and magnetite were found in various combinations in the black slips of six sherds.

Table 19 and figures 44-46 show the results obtained for the brown-black and black decoration on ceramics from the sites of Văleni, Tell Poduri, Bereşti, Ghelăieşti, and Tîrgu Ocna-Podei. With the exception of the samples from Bereşti, which had a brown slip as a dark coloured paint, all the sherds from the other sites had a rich black decoration. The brown slip, typical of ceramics from Bereşti, was found to contain haematite. All other samples contained magnetite together with hausmannite or jacobsite.

The variety of manganese-, iron-, and ferromanganese-bearing minerals in the black/brown decorative slips of Cucuteni-Tripolye ceramics is a further indication that impure, sedimentary concretions and/or bog accumulations of ore were discovered and used by prehistoric potters.

Figures 41-46 X-ray fluorescence and X-ray diffraction analyses of red, brown, and black slips of Cucuteni pottery.

Explanatory note:

Paint samples of sherds from Văleni, Tîrgu Ocna-Podei, Tell Poduri, Ghelăieşti, and Tîrgu Bereşti were analysed for elemental composition using X-ray fluorescence and for mineralogical composition using X-ray diffraction. A powder sample was scraped from the surface of the sherd prior to analysis in order to reduce clay contamination. Clay minerals were not detected, since upon firing clays lose most of their crystalline structure; however, quartz--as an important component of clays--is always detected in clay-based slips. While table 19 lists the specific samples analysed and the minerals found in the slips, these charts list only once the following results, since many analyses were repetitive:

| X-ray fluorescence (Figures 41-43) | X-ray diffraction (Figures 44-46) |
|---|---|
| 41 red pigment - iron | 44 red pigment - and brown pigment - haematite |
| 42 brown pigment - iron | |
| 43 black pigment - iron and manganese | 45 black pigment - jacobsite and magnetite |
| | 46 black pigment - hausmannite and magnetite |

For the X-ray diffraction analyses, a General Electric XRD-6 was used with copper K$\alpha$ radiation (nickel filter) at 25 kV, 45 ma.

For the X-ray fluorescence analyses, a General Electric spectrogoniometer (wavelength dispersive) was used with tungsten K$\alpha$ radiation (LiF analyzing crystal) at 40 kV, 40 ma.

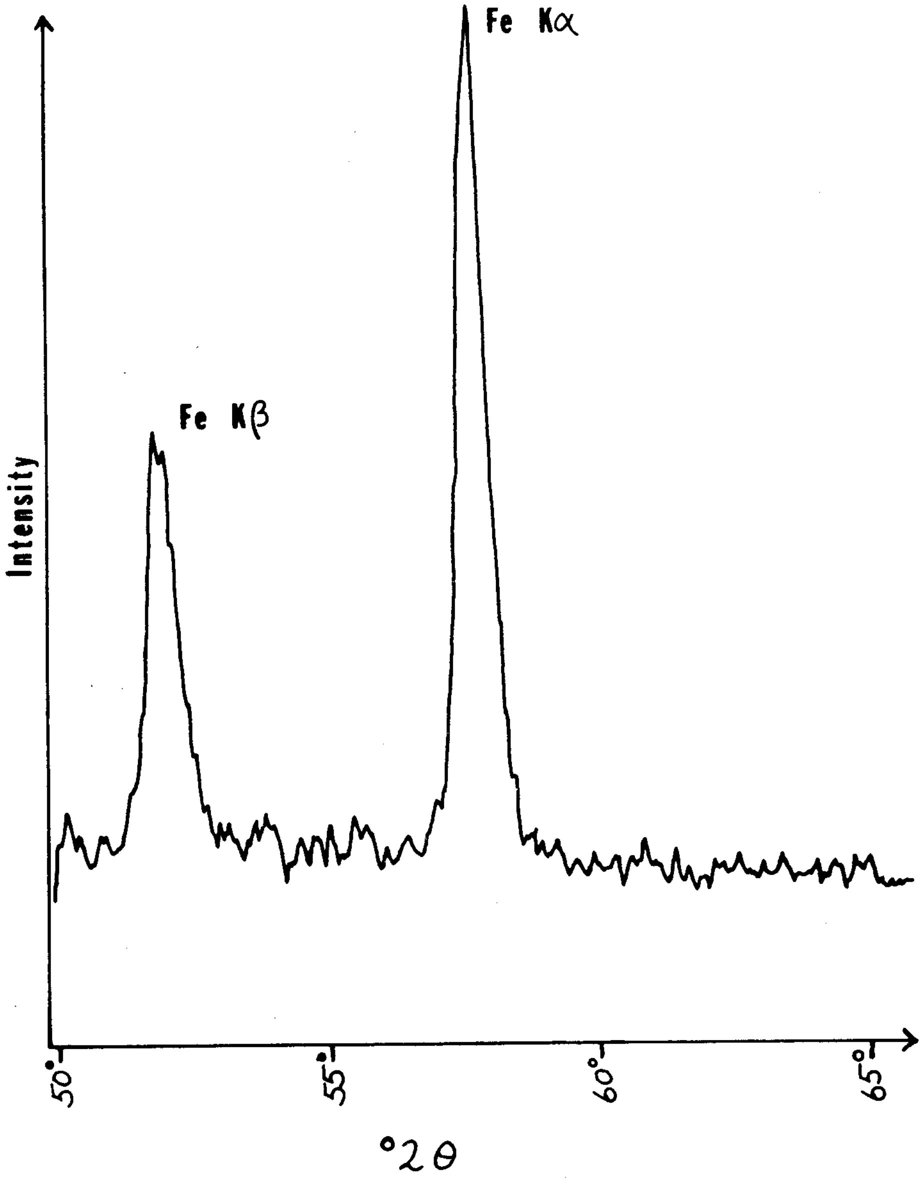


Figure 41

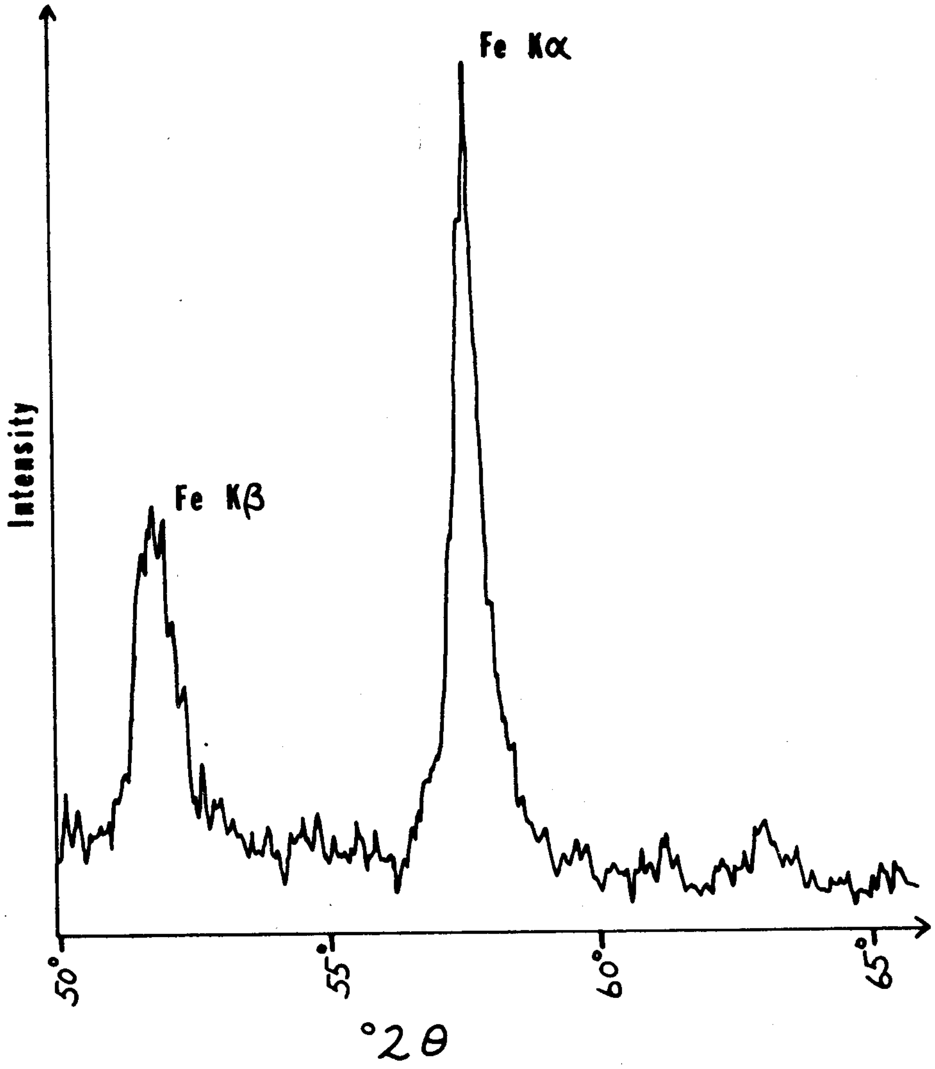


Figure 42

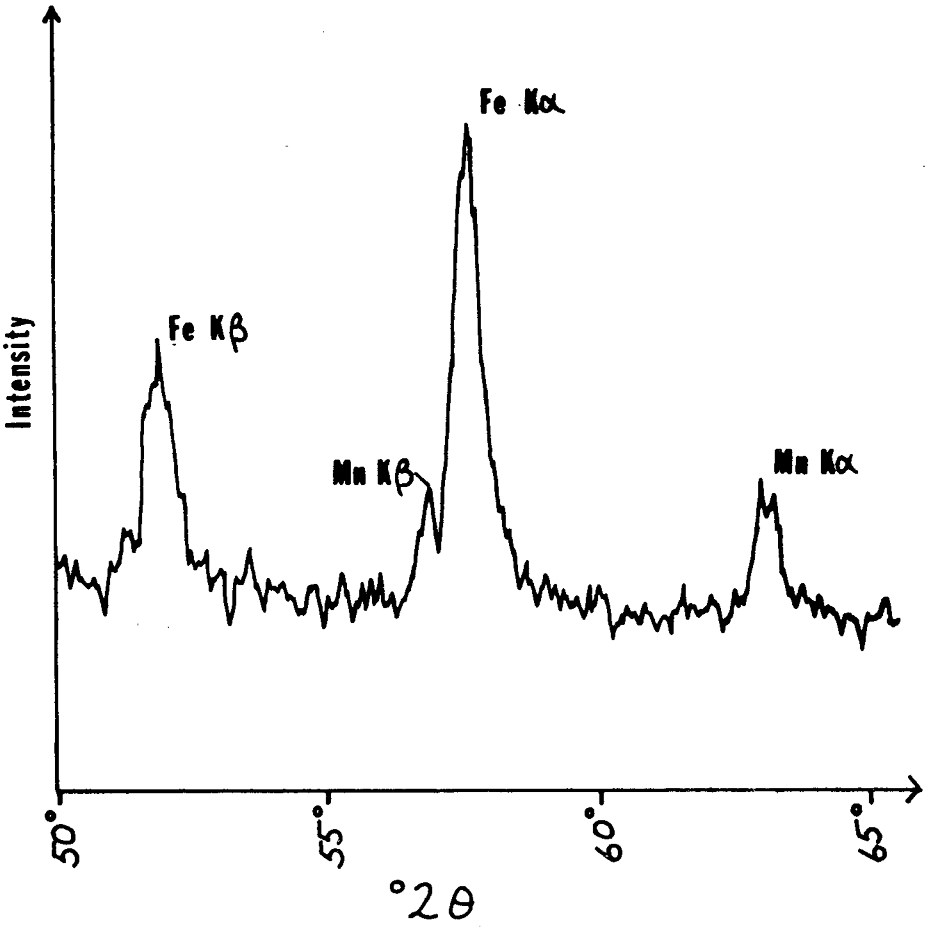
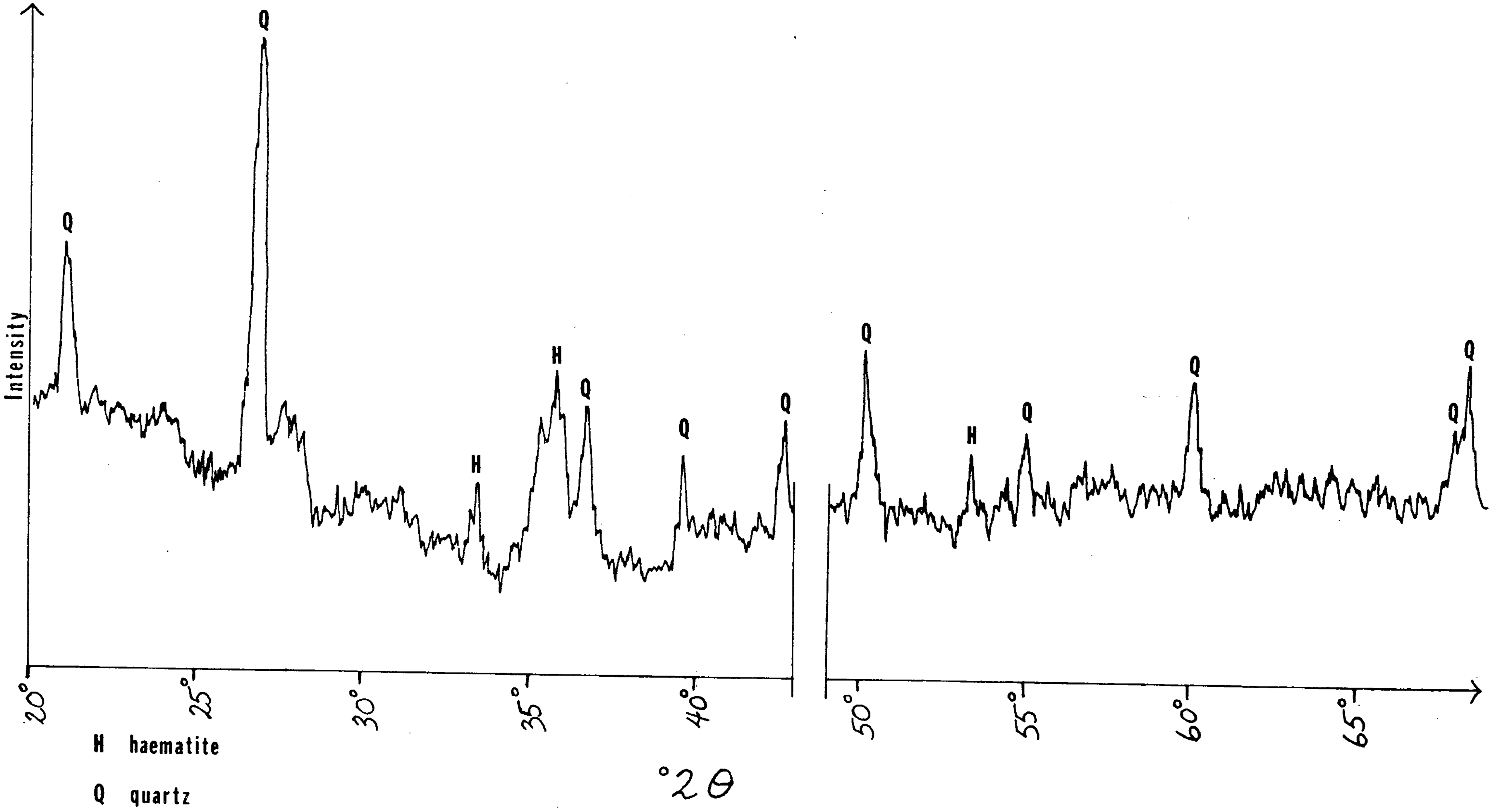


Figure 43


Intensity
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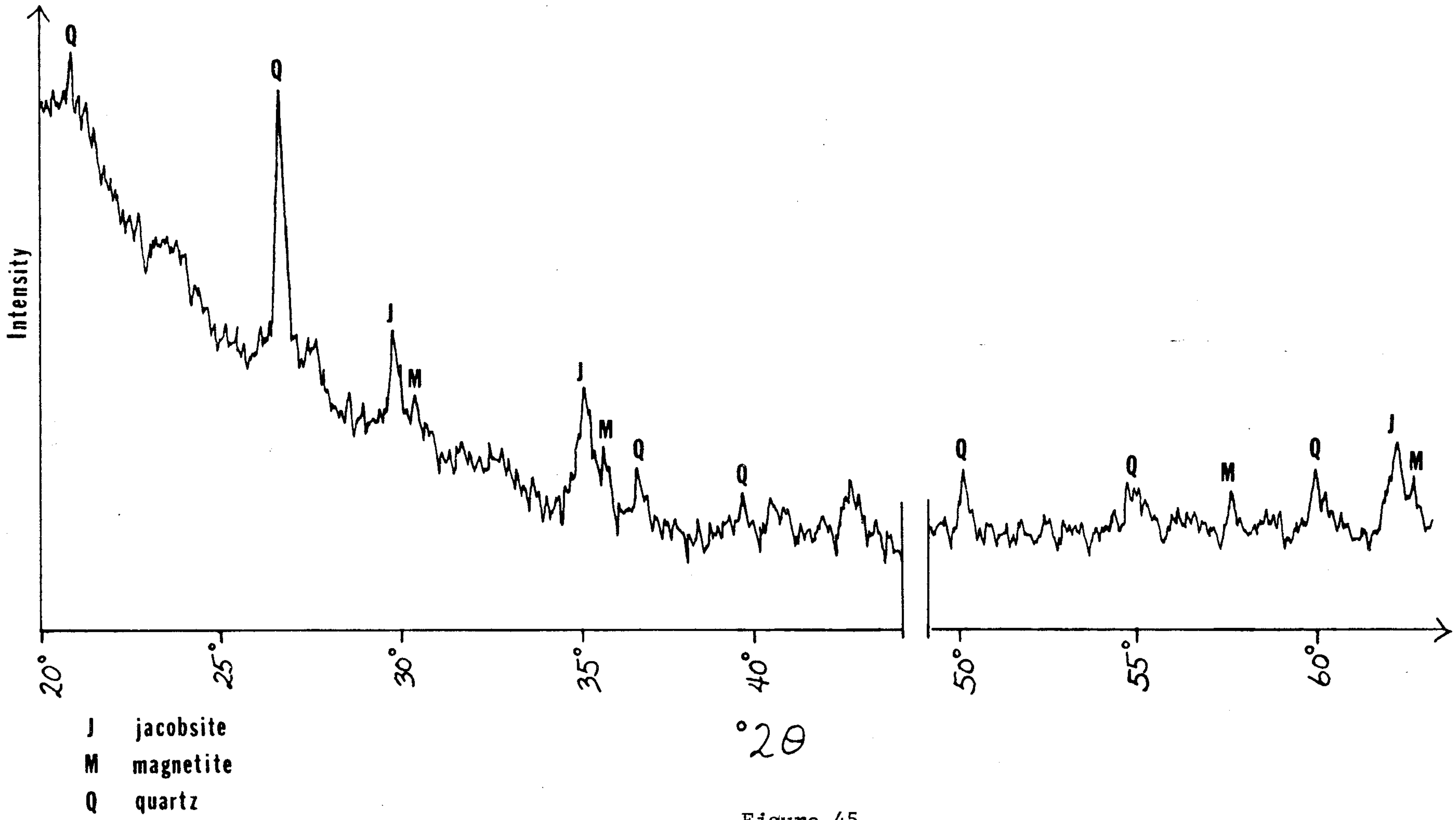
50°
55°
60°
65°
°2θ
H haematite
Q quartz

Figure 44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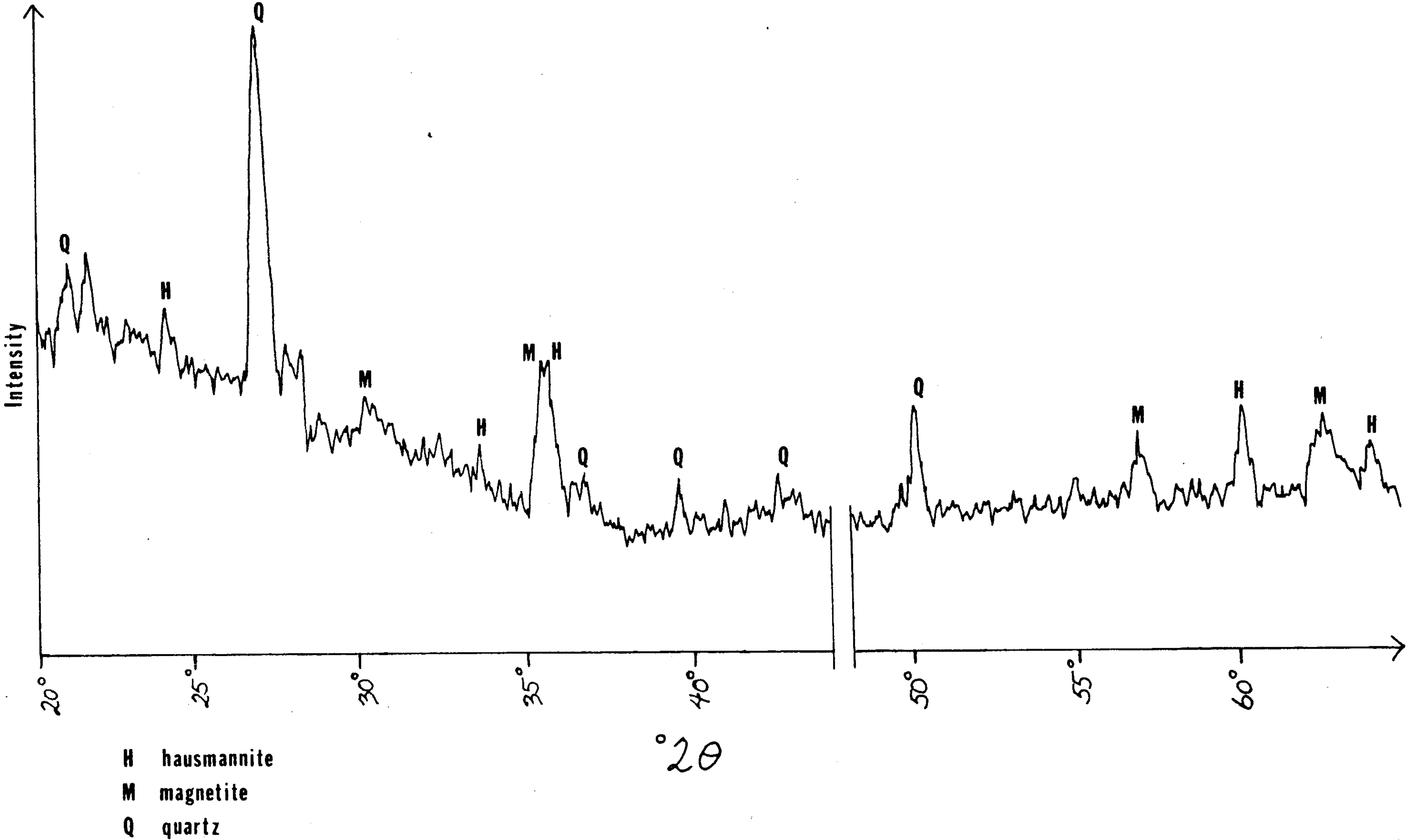
J jacobsite
M magnetite
Q quartz

Figure 45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55°
60°
°2θ
H hausmannite
M magnetite
Q quartz

Figure 46

Table 19 Results of X-ray diffraction analysis of black and brown pigments on Cucuteni A, AB, and B ceramics.

| Site (Period) | Sample No. | Minerals Detected |
|---|---|---|
| Văleni (B) | VL B 2 | Jacobsite*<br>Magnetite* |
| Văleni (B) | VL B 3 | Jacobsite<br>Magnetite |
| Tîrgu Ocna-Podei (B) | TO B 1 | Jacobsite<br>Magnetite |
| Tîrgu Ocna-Podei (B) | TO B 2 | Hausmannite*<br>Magnetite |
| Tell Poduri (B) | POD B | Hausmannite<br>Magnetite |
| Tell Poduri (AB) | POD AB | Jacobsite<br>Magnetite |
| Ghelăieşti (AB) | GH AB 1 | Hausmannite<br>Magnetite |
| Ghelăieşti (AB) | GH AB 2 | Hausmannite<br>Magnetite |
| Tîrgu Bereşti (A) | BER A 1 | Haematite* |
| Tîrgu Bereşti (A) | BER A 2 | Haematite |

---

* Jacobsite = $MnFe_2O_4$; Magnetite = $Fe_3O_4$; Hausmannite = $Mn_3O_4$; Haematite = $Fe_2O_3$

## III.C. Firing processes

### 1. Use of kilns

In man's increasing control over the elements and forces of nature, clearly it is the control and, more importantly, the manipulation of fire and gaseous by-products of combustion which ushered in the age of metals. This control is no more clearly evident than in the occurrence of specific constructions, i.e. kilns, built to contain, control, and regulate the vagaries of temperature and atmosphere during the firing of ceramics.

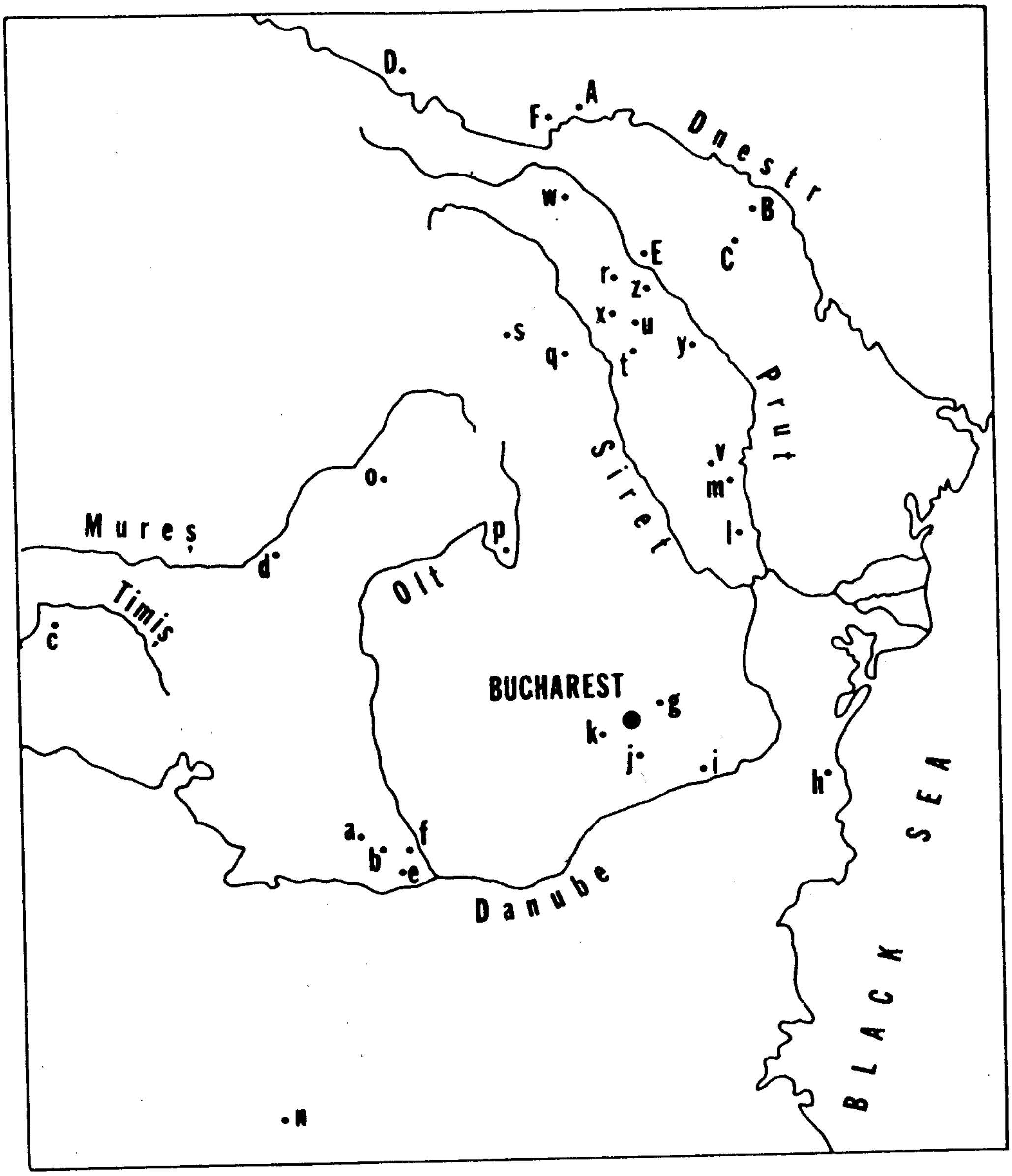
An almost infinite variety of ceramic firing techniques, with or without the use of kilns, has been recorded in a very rich, worldwide ethnographic literature (cf. Shepard 1956; Rye 1981). However, kilns, depending on form and construction, offer certain advantages over simple pits:

1) reduced effects of prevailing winds
2) reduced time to reach maximum temperature
3) maintenance of maximum temperature for a longer period of time
4) control over reduction/oxidation conditions
5) fuel conservation
6) slow cooling down period

The idea of the containment of the firing process will reduce the negative effects of prevailing weather conditions and thereby allow one to reach rapidly and maintain steadily the desired temperature. And, by not allowing heat to dissipate rapidly, as is almost unavoidable in pit firings, fuel is conserved. Control over *reduction* (i.e. the presence of carbon monoxide-CO-due to insufficient oxygen to combust the fuel) and *oxidation* (i.e. where the amount of oxygen is more than sufficient to combust the fuel) is possible with simple pit firings, as has been ethnographically documented on repeated occasions; but, depending on kiln construction and placement of fuel, the need for constant attention is reduced and the occurrence of "firing errors" may even be eliminated. The containment of the firing operation also allows a slow cooling-down period--thus reducing the possibility of fracturing of ceramics due to thermal shock.

Because of the inherently hazardous nature of all pyrotechnological operations, the firing of ceramics usually occurs at the exterior of the main settlement. Therefore, unless the extra-settlement area is surveyed, evidence for these operations oftentimes remains unexcavated.

Thirty-one sites, located northwest and west of the Black Sea and dating from the Early Neolithic to the Chalcolithic periods, have been found to show evidence of complete kilns, materials associated with kilns, or structures used exclusively for the production and drying of pottery. These "kiln sites" are acattered from present-day Bulgaria, across Romania, to Soviet Moldavia and the Ukraine (maps 13 and 14). The quality of the evidence for kilns on the Neolithic/Chalcolithic sites ranges from scanty and somewhat questionable (e.g., Hotărani, Vădastra, Tărtăria, Hăbăşeşti, *vide infra*) to unquestionable and excellent with almost complete preservation (e.g., Cîrcea, Gâlâbovtsi, Ariuşd, Glăvăneştii Vechi, Žvanets, Kostešty IX, *vide infra*).

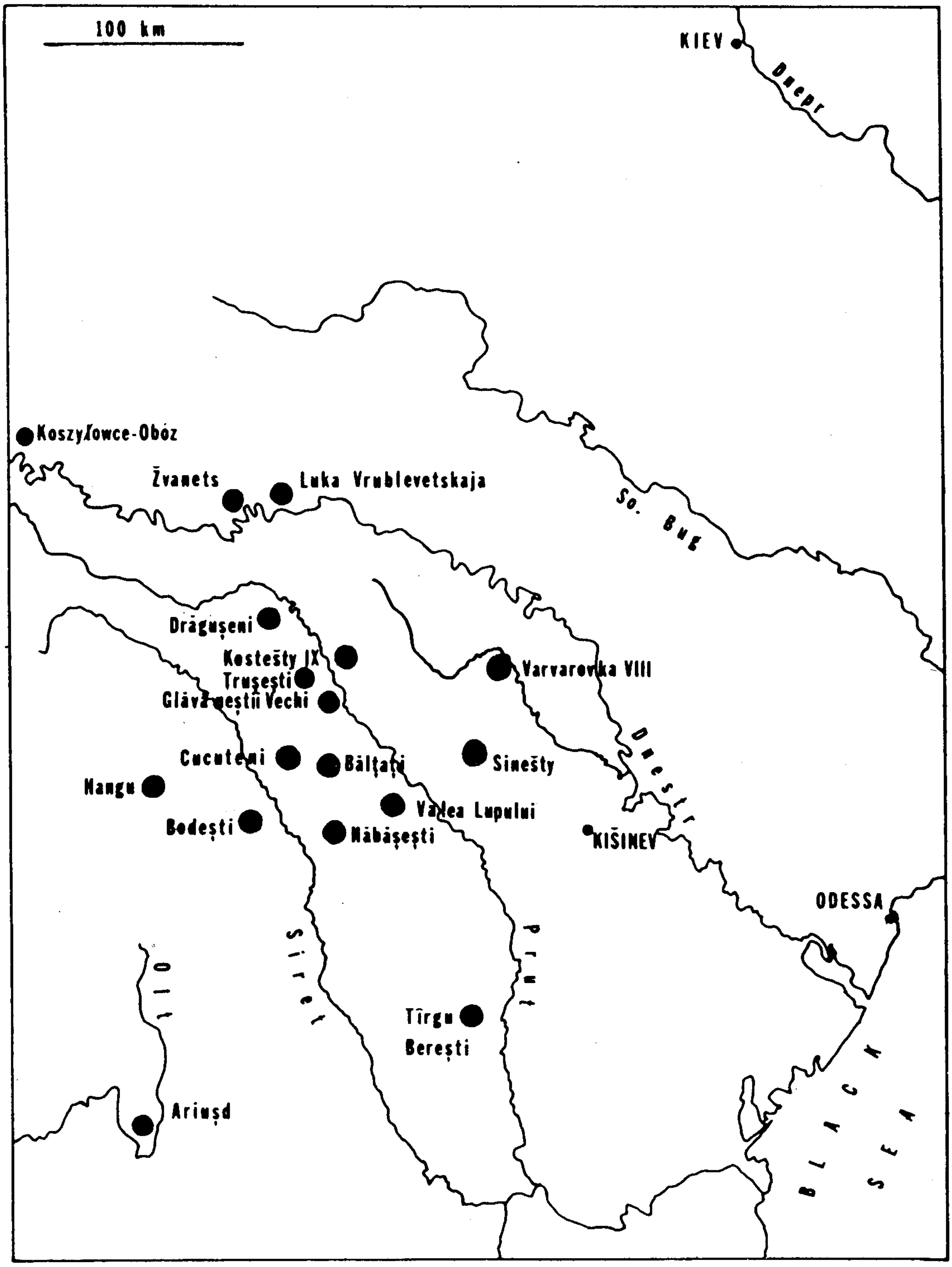


Map 13 Sites with evidence of kilns

NEOLITHIC
a. Cîrcea
b. Leu
c. Parţa
d. Tărtăria
e. Vădastra
f. Hotărani
g. Cernica
h. Techirghiol

CHALCOLITHIC
i. Vărăşti
j. Vidra
k. Jilava
l. Stoicani
m. Suceveni
n. Gâlâbovtsi
o. Bernadea
p. Ariuşd
q. Bodeşti
r. Truşeşti
s. Hangu
t. Hăbăşeşti

u. Bălţaţi
v. Tîrgu Bereşti
w. Drăguşeni
x. Cucuteni
y. Valea Lupului
z. Glăvăneştii Vechi
A. Luka Vrublevetskaja
B. Sinešty
C. Varvarovka VIII
D. Koszyłowce Oboz
E. Kostešty IX
F. Žvanets



Map 14 Cucuteni-Tripolye sites with kilns

Two types of kilns exist in this region and time period. The simplest type, the oldest evidence for which dates to the end of the Early Neolithic (Cîrcea), consists of a clay structure in the shape of a truncated cone; both fuel and charge (i.e. the clay objects to be fired) are situated together in the chamber. A variation on this form is the separation of the fuel from the charge by construction of a small, tubular side "chamber" in the wall of the kiln as a fuel access. Another variation of the simple kiln is the construction of two or more chambers being served by the same fuel access (cf. figures 48-54).

The most complex type of kiln found is that used by the potters of the Cucuteni-Tripolye culture (figures 47, 57, 59, 60). These kilns are cylindrical or rectangular in plan and consist of two vertically arranged parts: a lower section ("firebox") where the combustion of fuel takes place and an upper section ("chamber") where the pottery is placed (fig. 47). Both parts are completely separated by a horizontal grate which is perforated with small holes to allow the hot air below to rise into the upper chamber. This grate is supported by a short, median wall which separates the firebox into two halves (cf. fig. 57). This support wall has also been known to contain perforations or vents ("flues") to equalise the distribution of heat and air in the firebox in order to compensate for the uneven burning of fuel and the subsequent uneven firing of pottery (e.g., Glăvăneştii Vechi and Kosteşty IX, vide infra). One slight variation of this form of kiln can be seen at Luka Vrublevetskaja, where the firebox is constructed to one side and with the perforated grate supported on a rotund pillar; this early Tripolye A (=Pre-Cucuteni III) kiln may prove to be a transitional form between the simple kiln with a lateral firebox and the vertically arranged kiln.

The question has arisen, in reference to Hăbăşeşti and other sites, as to why some of the fragments of grates have "complete" perforations, while other fragments have some "incomplete" perforations (i.e., impressions; fig. 55). The best solution appears to be the fact that if the grate is perforated every 3 to 10 cm--which is usually the case--then the grate would be substantially weakened and unable to support a stack of vessels if there were too many holes; indeed, after studying fragmentary grates in museum collections in Romania, many of the fractures occurred across "complete" perforations. The "incomplete" perforations or impressions serve a dual purpose of allowing conduction of heat as well as maintaining the strength of the grate as a support for vessels.

These complex kilns used by Cucuteni-Tripolye craftsmen are known as "up-draught" kilns due to the obvious vertical movement of hot air into the firing chamber. E. Comşa (1976a; 1976b) and subsequently M. Nica (1978) have used the term "reverberatory kiln" in order to refer to these Cucuteni-Tripolye kilns. The application of the term "reverberatory" here is erroneous: Reverberatory designates a special type of down-draught kiln (fig. 47). This construction consists of a chamber in which the charge rests; on one side is the firebox, and on the opposite side is the chimney. At one end, the charge is separated from the gases emanating from the firebox by a low wall ("bagwall") in a down-draught kiln. In a reverberatory kiln, there are two bagwalls: one at the firebox end, the second at the chimney end. The roof of a down-draught kiln covers everything--the firebox, bagwall, charge--and

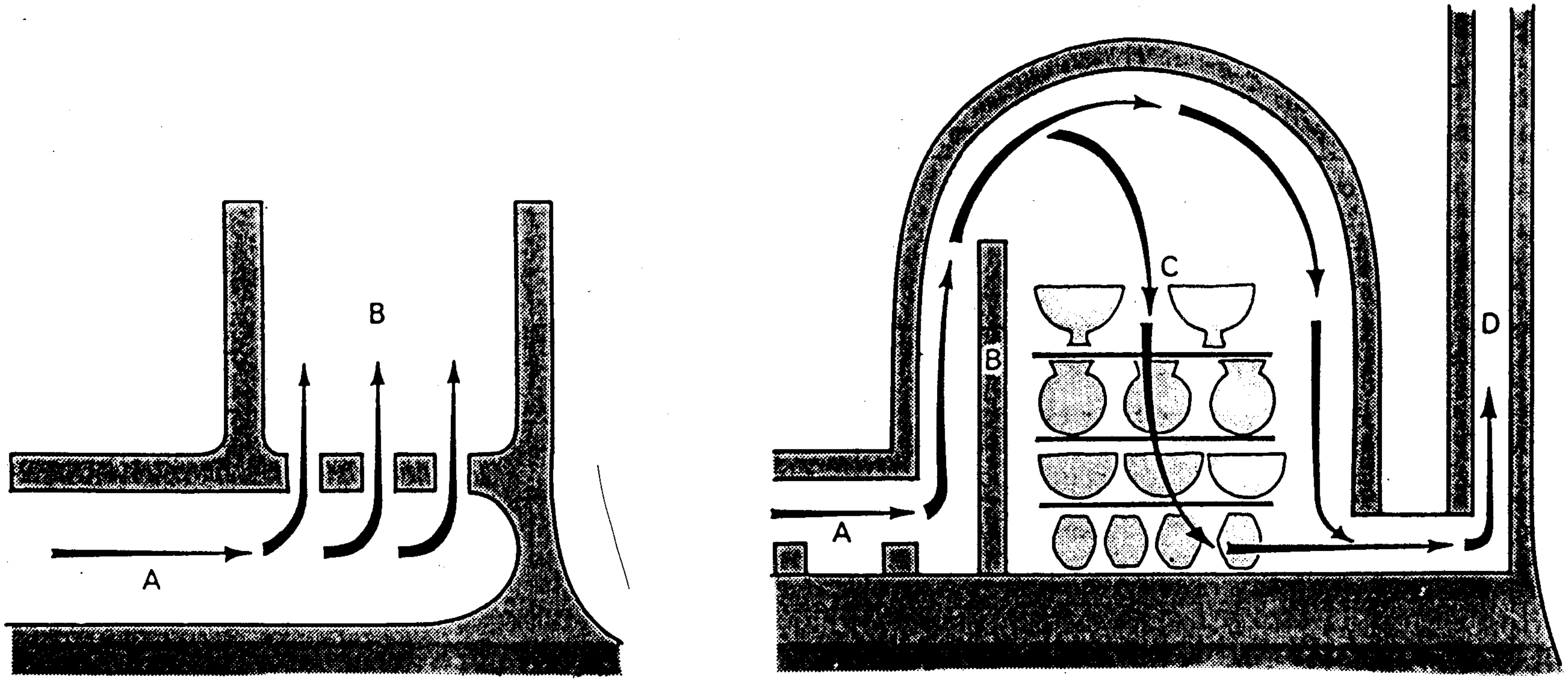


Fig. 47 Plan of an up-draught kiln, left (a. firebox, b. chamber) and plan of a down-draught kiln, right (a. firebox, b. bagwall, c. chamber, d. chimney).

is highest over the charge and thence slopes downward to the chimney flue, so that the hot air, after striking the roof, will be deflected down--or "reverberated"--upon the charge (fig. 47).

All evidence for simple and up-draught kilns is listed below in approximate regional and chronological order, with appropriate references and illustrations when they exist. Irregardless of the quality of the evidence, no information on kilns for this time period and geographical area has been overlooked or omitted so that the full evolutionary development of kiln pyrotechnology may be appreciated.

## III.C.1.a. Early Neolithic kilns

### CÎRCEA (Starčevo)

In the 1970s, nine kilns were discovered at this site: Four date to the Early Neolithic Starčevo culture and five date to the Middle Neolithic Dudeşti (=Vinča) culture (figs. 48, 49).

Three of the Starčevo kilns were situated on the southern edge of the site, along the protective ditch bordering the site; the fourth kiln, belonging to this early phase, appeared towards the interior of the site and contained polychrome ceramics dating to the Starčevo IV phase.

These Early Neolithic kilns (fig. 48) consisted of an access pit (D), lateral fuel chamber (C), pottery firing chamber (B), and an opening (A); the only exception to this was kiln no. 2 which had two adjoining firing chambers, both served by the same fuel chamber. The various dimensions are given in table 20. It is presumed by the excavator that vessels were placed into the kilns from above and were kept separate from the fuel and combustion ~~so as~~ to minimise surficial defects on the vessels. It is also thought that the opening of the kiln would also serve to regulate the temperature in the firing chamber by means of a cover. In the access pits of all four kilns, were found numerous fragments of both unpainted and polychrome pottery dating to the Starčevo culture, phase IV. In addition, polychrome sherds were also found on the base of the firing chamber of kiln no. 1. All kilns show evidence of firing; the walls of the firing chamber of kiln no. 1 had been fired through a thickness of 25 cm, indicating use of the kiln over a substantial period of time. Whether or not these four kilns were used contemporaneously is somewhat difficult to prove: The only evidence for this comes from kilns 1 and 2 which were build 4 m apart and at the exact same depth and in whose access pits were found polychrome sherds of identical style (Nica 1978).

## III.C.1.b. Middle and Late Neolithic kilns

### CÎRCEA (Dudeşti)

The five kilns from Cîrcea, belonging to the Dudeşti (=Vinča) culture, were scattered in different places over the site; kiln no. 5 was located on the southeast margin of the site, no. 6 in the southern margin, and no. 9 was located in the interior. All kilns, again, were of the same basic form (fig. 40:5, 6) as the earlier kilns at this site

## Table 20

### Dimensions of Early Neolithic kilns from Cîrcea

| 1* | 2 | 3 | 4 | |
|---|---|---|---|---|
| 0.85 | both<br>1.25-0.75 | 0.80 | 0.65-0.35 | Diameter of base of firing chamber (m) |
| 0.69 | 0.50 | 0.50 | 0.35 | Preserved height |
| 0.75<br>0.60<br>0.25 | n.g. | 0.65<br>0.40<br>0.20 | n.g. | Dimensions of fuel chamber (l x w x h) |
| 2.50<br>1.50 | 3<br>2.5 | 1.60<br>1.50 | 2.40<br>1 | Dimensions of access pit (l x w) |

### Dimensions of Middle Neolithic Kilns from Cîrcea

| 5 | 6 | 7 | 8 | 9 | |
|---|---|---|---|---|---|
| 0.65 | 1 | approx.<br>1-1.2 | 0.75 | 0.65 | Diameter of base of firing chamber (m) |
| 0.40 | 0.40 | n.g. | 0.40 | 0.35 | Preserved height |
| 0.80<br>0.70<br>0.35 | n.g. | n.g. | n.g. | absent | Dimensions of fuel chamber (l x w x h) |
| 2.25<br>2.25 | 2.50<br>2 | n.g. | 2<br>1.25 | absent | Dimensions of access pit (l x w) |

* Numbering sequence after excavator's report (Nica 1978).

n.g. = Dimensions not given due to incomplete preservation.

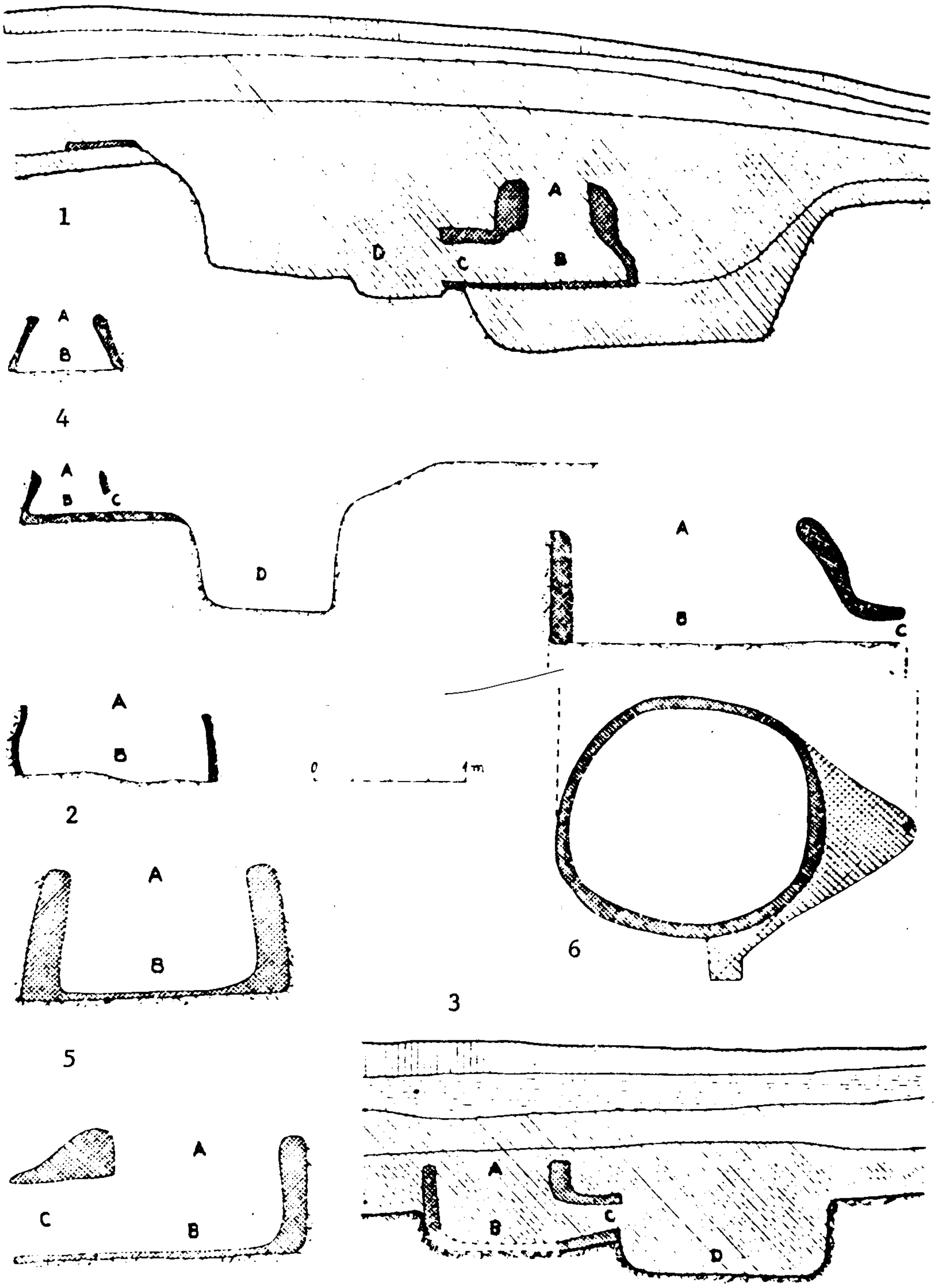


Fig. 48
CÎRCEA: (1,2,3,4) Starčevo Culture; (5,6) Dudeşti-Vinča Culture
A-Kiln opening; B-Firing chamber; C-Fuel chamber; D-Access pit.

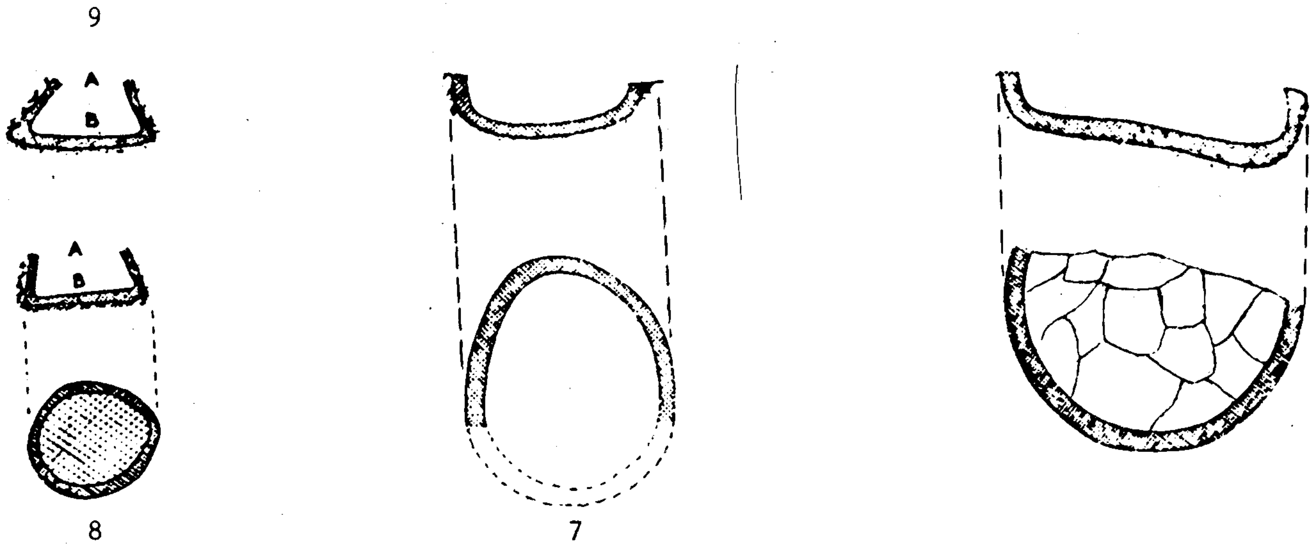


Fig. 49 Kilns from CÎRCEA (nos. 7, 8, and 9) and from HOTĂRANI.

with the exception of kiln no. 9 which lacked a fuel chamber altogether. Dimensions of the kilns are given in table 20. The fuel and firing chambers of all kilns show evidence of use--especially no. 5 whose clay walls had been fired to a depth of 15 cm. Sherds of the Dudeşti culture were associated with these kilns (e.g., in kiln no. 5, sherds appeared on the base of the fuel chamber; sherds were also found in the access pit of no. 6 and in a semi-subterranean dwelling next to kiln no. 7). In all instances, kilns 1-9 were associated with one or more pits which contained ceramic waste products and/or sherds (Nica 1978).

### LEU (Dudeşti)

A kiln with two firing chambers was discovered on the margin of the eastern terrace of this site, quite close to a source of water (fig. 50). Both chambers were situated at the exact same depth and measured approximately 1.5 m in diameter. The walls were preserved to a height of 0.50 m and were inclined so as to form a truncated cone. The chambers were interconnected by a "tunnel" 20 cm in height. The single fuel chamber, which had served both firing chambers, had mostly collapsed into the access pit. From the access pit were retrieved burnt wattle-and-daub fragments, sherds, animal bones, a stone axe, and a bone used for burnishing pottery (Nica and Niţa 1979; Nica 1978).

### PARŢA (Vinča)

A simple kiln belonging to the Vinča culture was found. The walls formed a truncated cone. No dimensions nor further details are given (Popescu 1964:553, note 13).

### TǍRTǍRIA (Turdaş)

A simple, oval-shaped kiln measuring 0.55 x 0.48 m in plan was excavated (fig. 51). The walls of the kiln were 4-5 cm in thickness (Horedt 1949:50-51).

### VǍDASTRA (Vǎdastra)

A simple kiln, with no separate fuel chamber, was discovered (fig. 52). The base was approximately rotund, having a diameter of 0.75 m. The walls of the firing chamber were mostly destroyed. Charcoal found on the base was analysed and identified as Quercus sp. (Mateescu 1959: 68-69, pl. II:2). In 1962 and 1971, additional kilns were found on this site, dating to the Vǎdastra II phase (Comşa 1976b:355).

### HOTǍRANI (Vǎdastra)

Highly fragmentary remains of a kiln dating to Vǎdastra phase II were found (fig. 49). The kiln was rotund and consisted of a firing chamber only (Nica 1978:25).

### CERNICA (Boian)

Excavations by E. Comşa revealed two small kilns dating to the Bolintineanu phase of the Boian culture (cf. figs. 1, 2; map 4). They were circular in plan (0.90 m in diameter) with no lateral opening (fig. 51). The floors of the kilns were burnt dark red and were heat

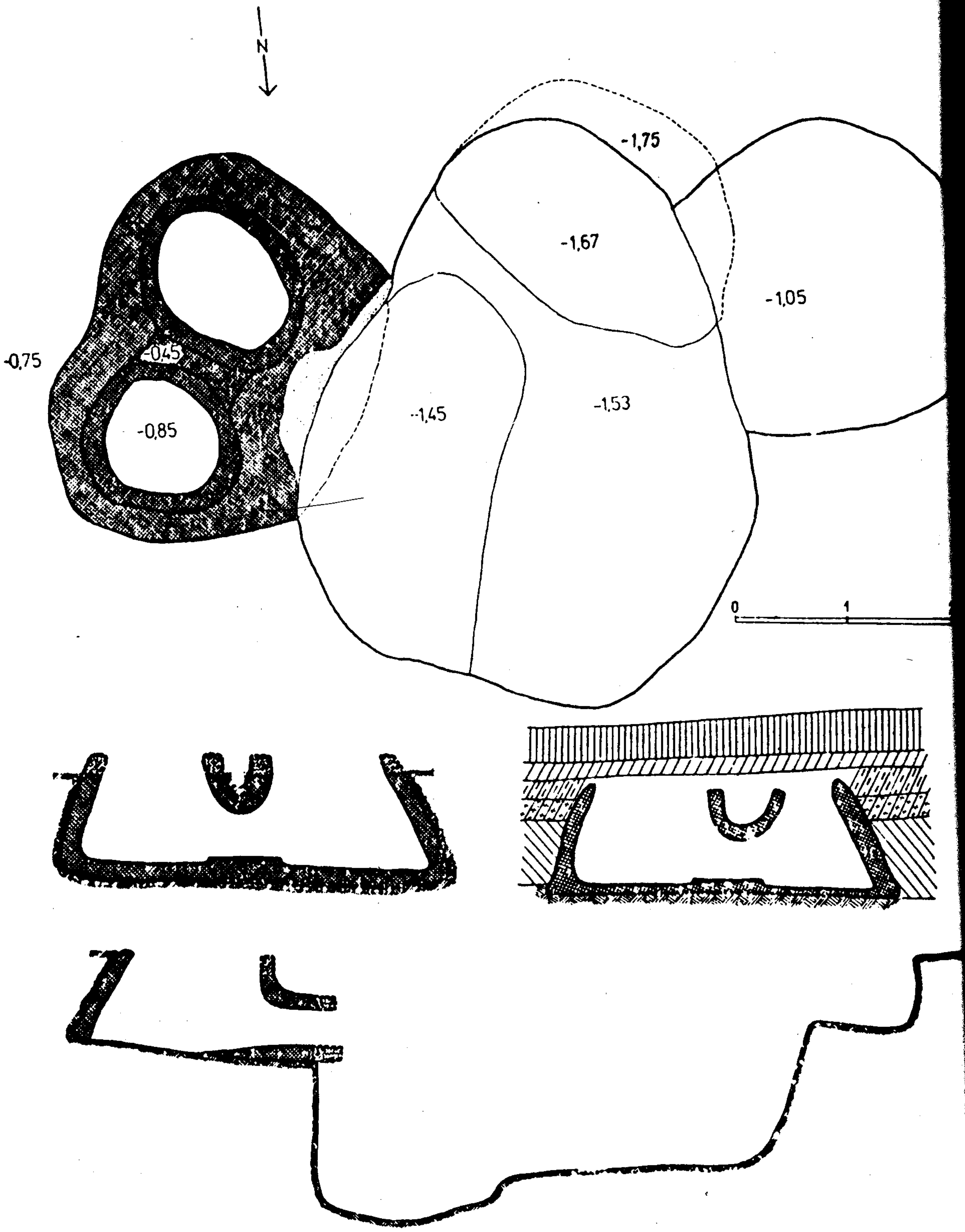


Fig. 50  Kiln from Leu.

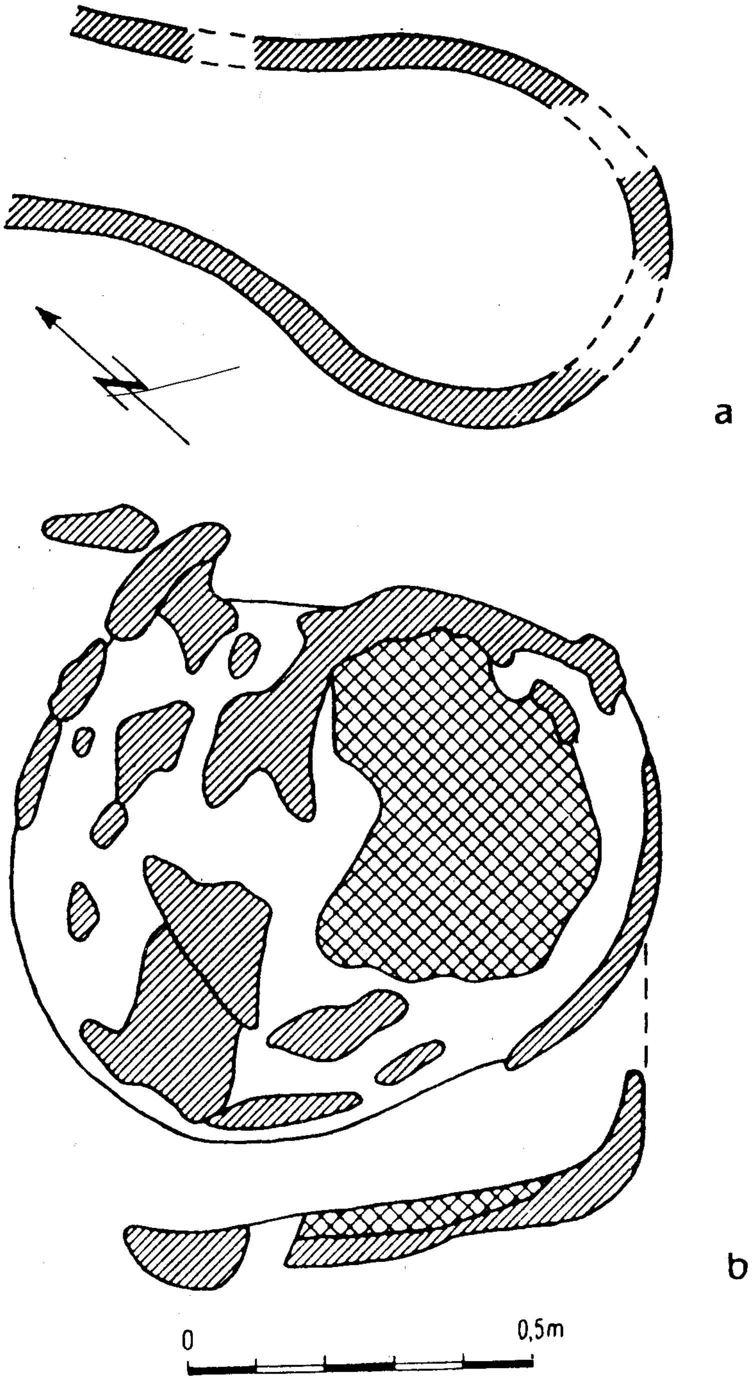


Fig. 51 Kilns from Tărtăria (top) and Cernica (bottom).

cracked in a mosaic pattern. The walls were preserved to a height of 15 cm and are estimated to have been originally 40 cm and cone-shaped in profile (Comşa 1976b).

### TECHIRGHIOL (Hamangia)

Excavations by E. Comşa and D. Galbenu uncovered a simple kiln which was circular in plan (approximately 1 m in diameter). The kiln was found inside the settlement and dates to the "Ceamurlia de Jos" phase of the Hamangia culture (cf. fig. 2; maps 4, 13) (Comşa 1976b).

## III.C.1.c. Chalcolithic kilns

### VĂRĂŞTI (Gumelniţa)

A simple, ~~circular~~ kiln with a diameter of 1.40 m was found by E. Comşa (fig. 52; map 13). Both floor and walls were burnt red. The arched walls were preserved to a height of 15 cm but are estimated to have been about 60 cm (Comşa 1976b).

### VIDRA (Gumelniţa)

D. Rosetti reported that he had excavated a simple, ovoid-shaped kiln (mentioned in Florescu 1965:189 and Horedt 1949:51, note 9).

### JILAVA (Gumelniţa)

A kiln was excavated by D. Rosetti, but details are missing (mentioned in Comşa 1976b).

### STOICANI (Stoicani-Aldeni)

Fragments of perforated grates, made of fired clay, have been found. The excavator considers these grates to be connected with kilns (Dragomir 1977:8).

### SUCEVENI (Stoicani-Aldeni)

Fragments of perforated grates, which are believed to be connected with kilns, have been found (Dragomir 1977:8-9).

### GÂLÂBOVTSI (Krivodol/Sălcuţa)

One kiln, dating to the Balkan Chalcolithic period, has been found in northwestern Bulgaria, not far from Sofia, in connection with a settlement (fig. 53). This simple kiln, without a separate fuel chamber, was oval-shaped in plan and measured 2.50 x 1.60 m. The walls were destroyed, but the kiln was found with 28 vessels and other clay objects *in situ*. The pottery assigns the kiln to the Krivodol culture (=Sălcuţa culture in southern Romania) (Petkov 1964).

### BERNADEA (Petreşti)

A kiln has been found at this settlement, but details are lacking (Popescu 1968:684, note 54).

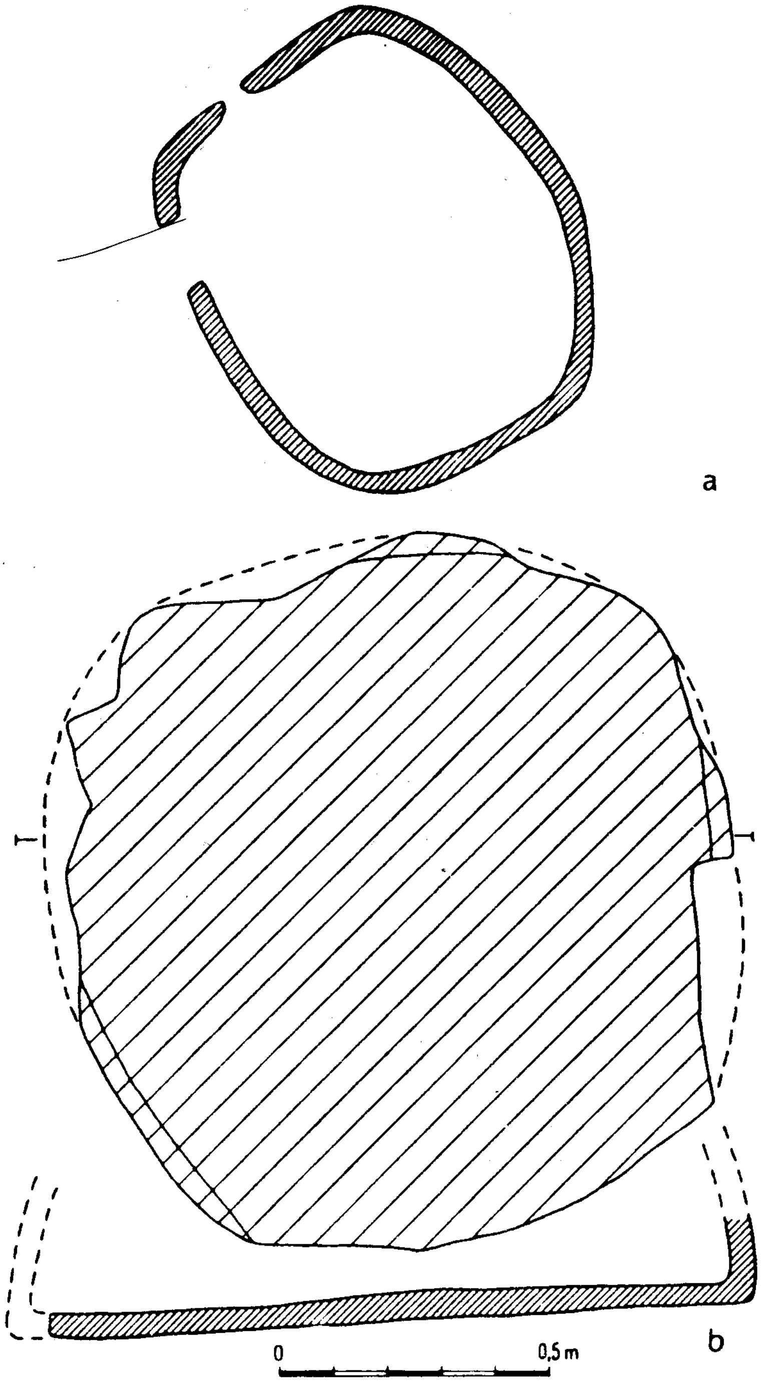


Fig. 52 Kilns from Vădastra (top) and Vărăşti (bottom).

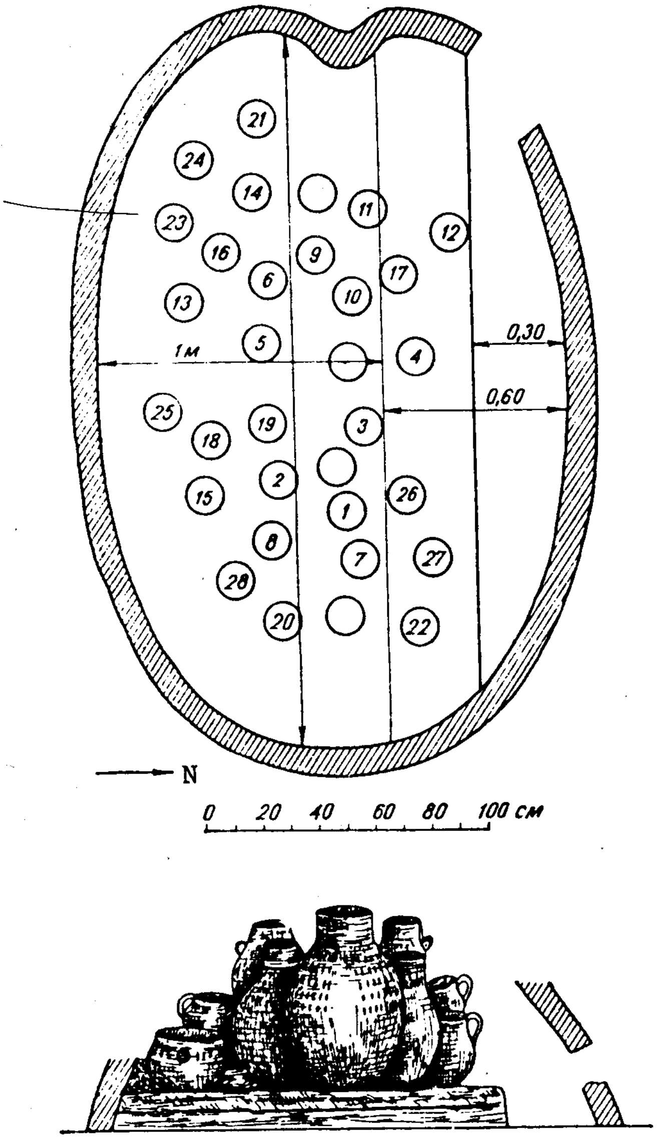


Fig. 53 Kiln from Gâlâbovtsi, Bulgaria.

## ARIUŞD (Cucuteni A)

At the beginning of this century, F. László had excavated a partially destroyed, simple kiln (fig. 54). The circular firing chamber had a diameter of 2 m and arched walls preserved to a height of approximately 0.40 m. No less than 15 vessels were found *in situ* in the chamber. In the middle stood a vessel 63 cm high, around which the other vessels were placed; it follows that the original height of the kiln had to accommodate the height of this vessel (Comşa 1976a; 1976b).

In the late 1970s, excavations were resumed at this site, uncovering a total of 11 simple kilns (Székely and Bartók 1979; Zaharia, et al. 1981, 1982). These kilns had an oval or circular ground plan--diameters range from 1.20 to 1.40 m--and were built quite close to one another. Eight of the kilns were situated northeast of the old László excavations. Inside the kilns, fragments of painted and unpainted vases and loom weights were found. Many of these sherds were deforned and transformed into a glassy material (i.e., kiln wasters).

Northwest of the site were found still another group of circular kilns, built one after another. Among these kilns, was a complex of one central kiln with two smaller lateral firing chambers. The central chamber was circular in ground plan, measuring 1.10 m in diameter; the arched wall was preserved to a height of 30 cm. No vases were found inside the chamber, but outside the western wall was a single vase. Excavations had revealed that the foundation of the central chamber itself had a complex "stratigraphy": At the very base was a layer of burnt red earth 30 cm thick, over which was spread a 5 cm layer of clay. This was followed by a 2 cm layer of fine yellow sand, over which was again placed a 3 cm layer of clay. Next followed a layer of soil 5 cm thick, 2 cm of fine yellow sand, and finally the uppermost layer was 3 cm of clay (Székely and Bartók 1979). Evidently, this kiln was used on repeated occasions by re-surfacing its base, and probably also its walls, since there is no technological advantage in creating such a "stratigraphy" other than re-lining a previously fire-damaged surface.

The two lateral firing chambers of the aforementioned kiln were later added to the east and west sides of the central chamber. The eastern chamber is oblong in ground plan (100 x 50 cm) with a vault made of wattle-and-daub. No sherds or pottery were found in the interior. The western chamber had the same plan and arch but was constructed only of clay. In the wall of the southern side of this western chamber, a tube-shaped "chimney" was constructed. This "chimney" was square in cross-section (measuring 7 cm across) and, according to the excavators, was produced by positioning a split log of the same dimensions in the appropriate place, building the vault around the log, and then removing the log. Also, according to the excavators, because no traces of carbonaceous deposits or soot were found on the interior surface, the "chimney" may have served as a temperature regulator; this may also explain the fact that the "chimney" opening was stopped by a clay lid (Székely and Bartók 1979). Two unpainted vases were found inside this chamber.

The openings of both lateral chambers were to the north, while the opening of the central chamber was to the south.

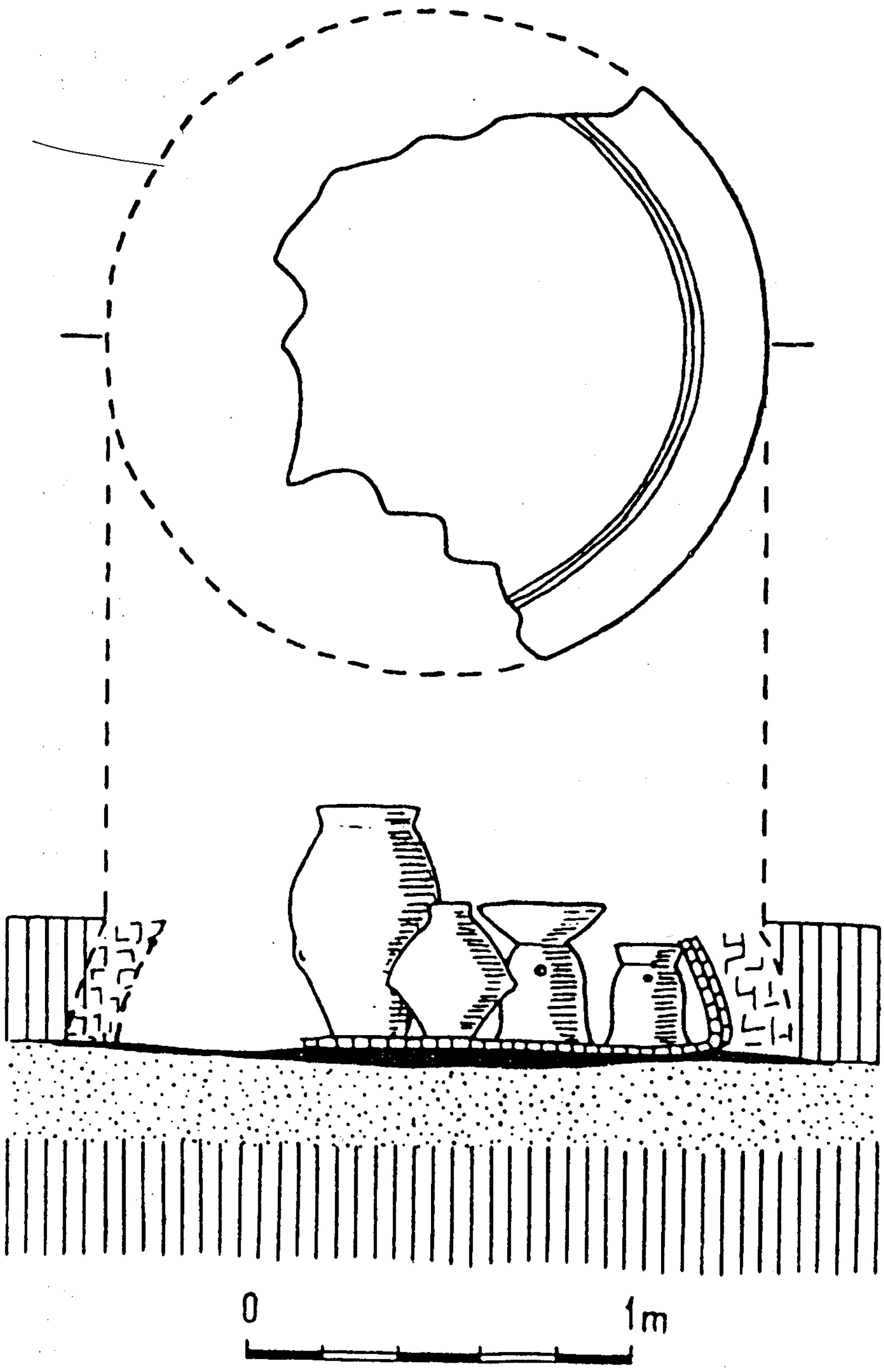


Fig. 54 Kiln from Ariuşd

The other kilns in the vicinity of the above-described complex were circular in ground plan (diameter 1 m). The walls were constructed of clay. A circular opening at the top served as ventilation which was covered by a sherd of a large storage vessel. The kilns were generally empty upon discovery, save for sherds of painted and unpainted vases (Székely and Bartók 1979).

### BODEŞTI-FRUMUŞICA (Cucuteni A)

A partially destroyed complex, double-chambered up-draught kiln was found. The firebox was 1 m in diameter, with two fuel chambers, divided by a support wall, and with two fuel accesses. The upper firing chamber has a slightly conical shape in section and is separated from the firebox by a perforated clay grate. The reconstruction by the excavator is not supported by the archaeological evidence and, due to its confusing nature, is not reproduced here (Matasă 1946:25-26, no. 9; Comşa 1976a; 1976b).

### TRUŞEŞTI (Cucuteni A)

On the southeast margin of the site, appeared three dwelling complexes with remains of partially perforated clay grates and of kiln vaults constructed on a skeletal framework of branches. The best preserved remains come from the north side of dwelling 79, which consist of numerous fragments of the vault and partially perforated grates. In connection with all remains of kilns found at this site, fragmented and whole vessels of various sizes were also found, usually grouped around the grates. The incised and painted decoration of these ceramics allows the dating to be fixed to the Cucuteni A period (Petrescu-Dîmboviţa, et al. 1962).

### HANGU (Cucuteni A)

Two destroyed kilns were found in the interior of the settlement. No further details are available (Nicolăescu-Plopşor and Petrescu-Dîmboviţa 1959).

### HĂBĂŞEŞTI (Cucuteni A)

In the vicinity of dwelling no. 9, many fragments of grates were found in pits. From reconstruction, these grates were horseshoe-shaped with dimensions 48.5 cm (l) x 34 cm (w) x 4 cm (d). On the upper surfaces were "incomplete" perforations formed by finger impressions (fig. 55). The grates were made of chaff-tempered clay.

Unfortunately, no sherds nor pottery were found in association with these fragmentary grates. Moreover, similar grates were found inside dwellings. It appears that there were two types of pits found outside of dwellings: rubbish pits with grate fragments inside and "fire pits" with grate fragments above the pit. The latter, according to the excavators, was possibly associated with pottery firing, after which broken grates were discarded into the rubbish pits. It is assumed that fireplaces with similar grates, found inside dwellings, would have been used for cooking (Dumitrescu, et al. 1954:189-198).

Based on the highly fragmentary evidence found, the excavators

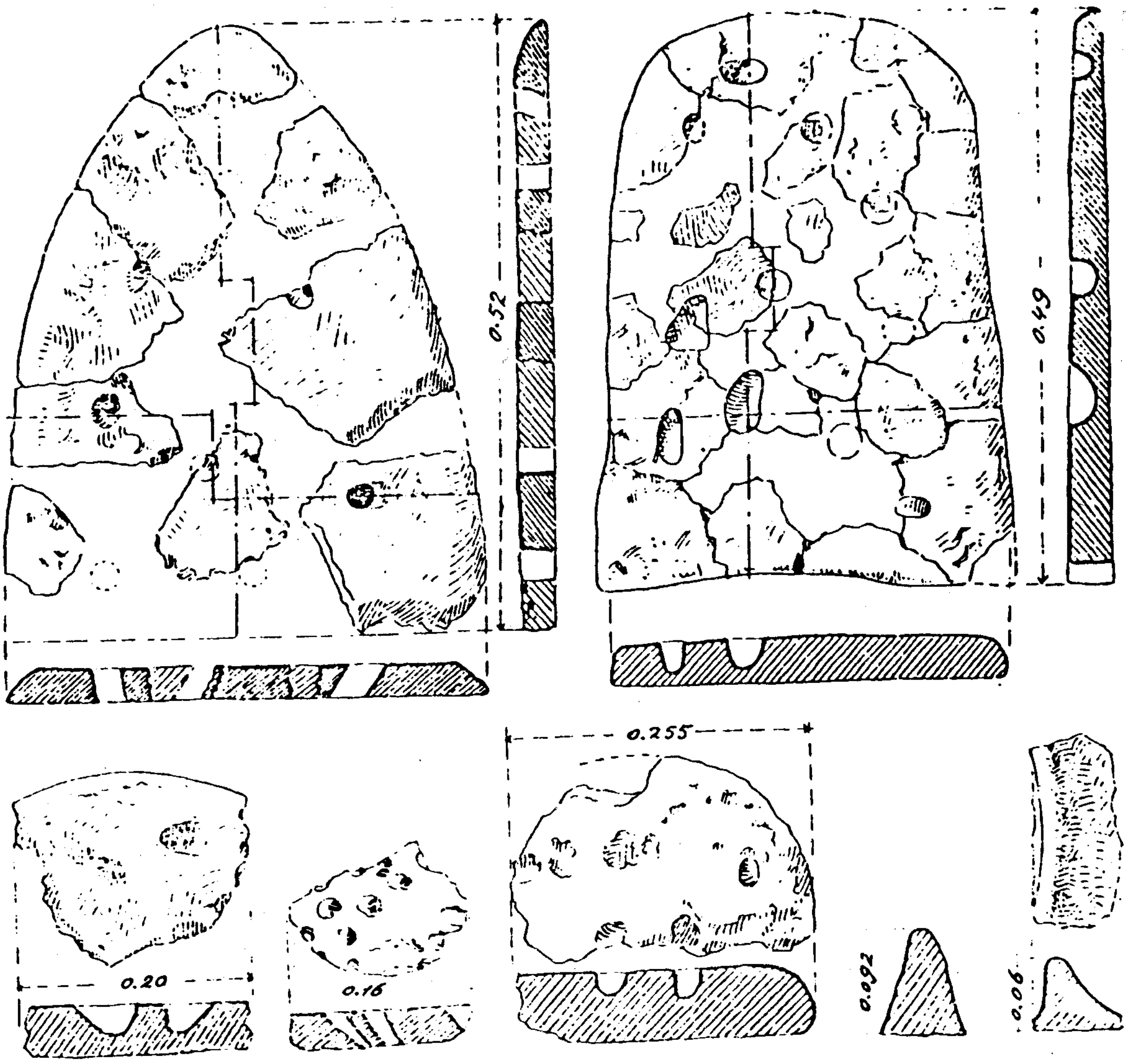


Fig. 55 HĂBĂŞEŞTI - Fragments from grates with complete or partial perforations, as well as supports for the grates (lower right).

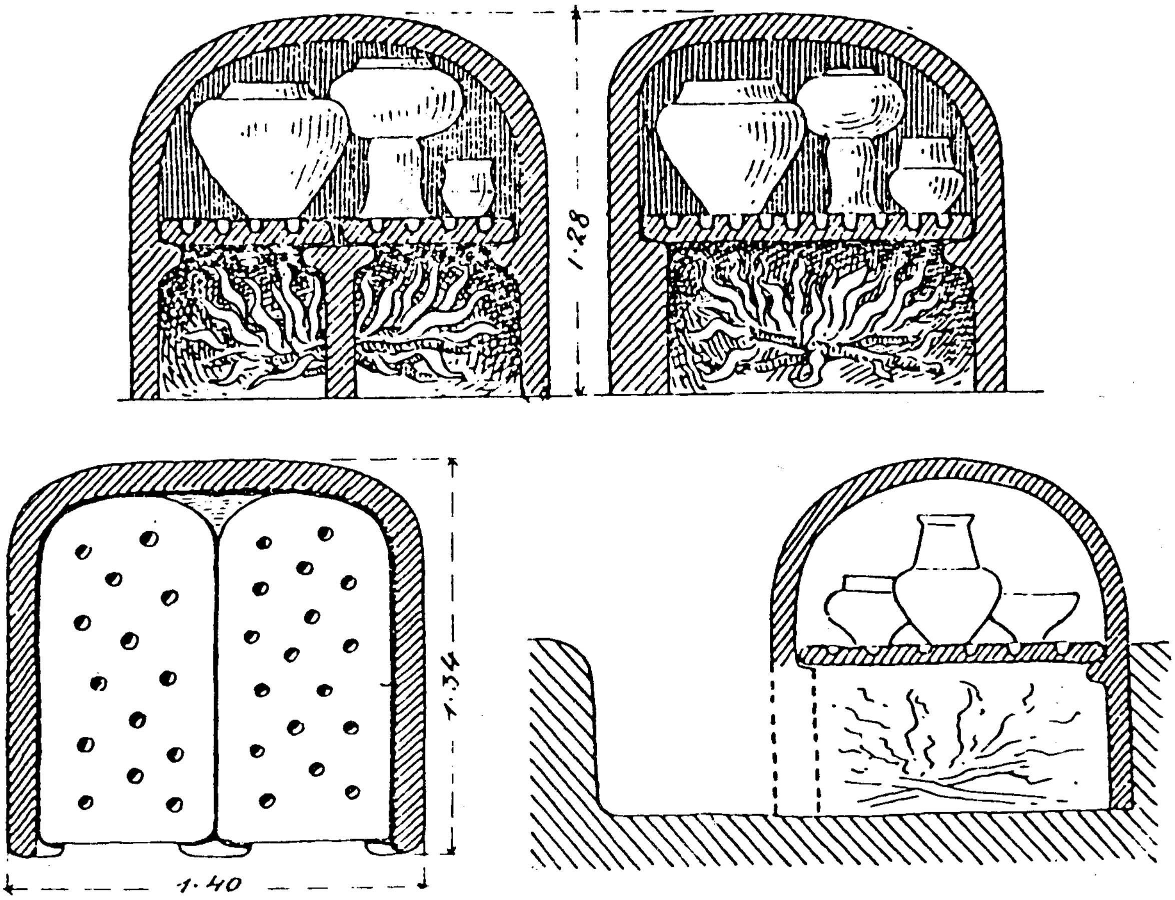


Fig. 56

HĂBĂŞEŞTI - Attempted reconstruction of a kiln.

reconstructed an up-draught kiln (fig. 56). However, this reconstruction cannot be supported for the following reasons: No evidence of any superstructure nor infrastructure (i.e. firebox, support wall for the grate) was found with the grate fragments.

### BĂLŢAŢI (Cucuteni A)

Fragmentary remains of grates were found in pits (M. Dinu: persona communication, 1982).

### TÎRGU BEREŞTI (Cucuteni A)

Remains of kilns have been found at this settlement, but details have not been published yet (I. Dragomir: personal communication 1982).

### DRĂGUŞENI (Cucuteni A and AB)

There are several loci of prehistoric activity: At "Deal la Lutarie" (approximate translation: 'hill to clay source'), is a local source of good quality clay which was exploited during the Chalcolithic as evidenced by pits filled with burnt clay debris, ash, charcoal, and sherds (Crîşmaru 1977:15-17). Some of these pits appear to have been lined with chaff-tempered clay, since burnt red. Fragments of grates with "incomplete" perforations or impressions were also found in the pits. No remains of dwellings occur at this locus--pottery-making appears to have been the only activity. The actual Cucuteni A settlement is located about 1½ km to the east, at locus "Ostrov", where remains of grates were found inside a dwelling in association with a hearth, presumably used for cooking (Crîşmaru 1977:76-77). At "Deal la Lutarie" are also pits with traces of grates and sherds dating to Cucuteni AB.

### CUCUTENI (Cucuteni B)

Remains of fragments of a grate were found (Schmidt 1932, pl. 36:3)

### VALEA LUPULUI (Cucuteni B)

The remains of two complex, up-draught kilns were found--one not being well preserved. The second kiln had a double-chambered firebox, separated by a support wall. The grate, perforated by 20 holes, was made of a clay-chaff admixture, 15 cm in thickness. This grate was supported by the lower, dividing wall of the firebox (cf. kiln from Glăvăneştii Vechi, infra) and also by a series of cones protruding laterally from the kiln wall (Dinu 1957).

### GLĂVĂNEŞTII VECHI (Cucuteni B)

At approximately 100 m north of this settlement, a well preserved kiln was found (fig. 57). A double-chambered firebox, divided by a support wall, had the dimensions 1.30 m (diameter) and 0.45 m (height). The dividing wall was 30 cm thick and had three holes or flues. The grate was made of a clay-chaff admixture. The diameter of the upper, firing chamber varied between 1.55 m and 1 m and was preserved to a height of 1 m (Nestor, et al. 1951:63; Florescu 1965; Comşa 1976a, 1976b).

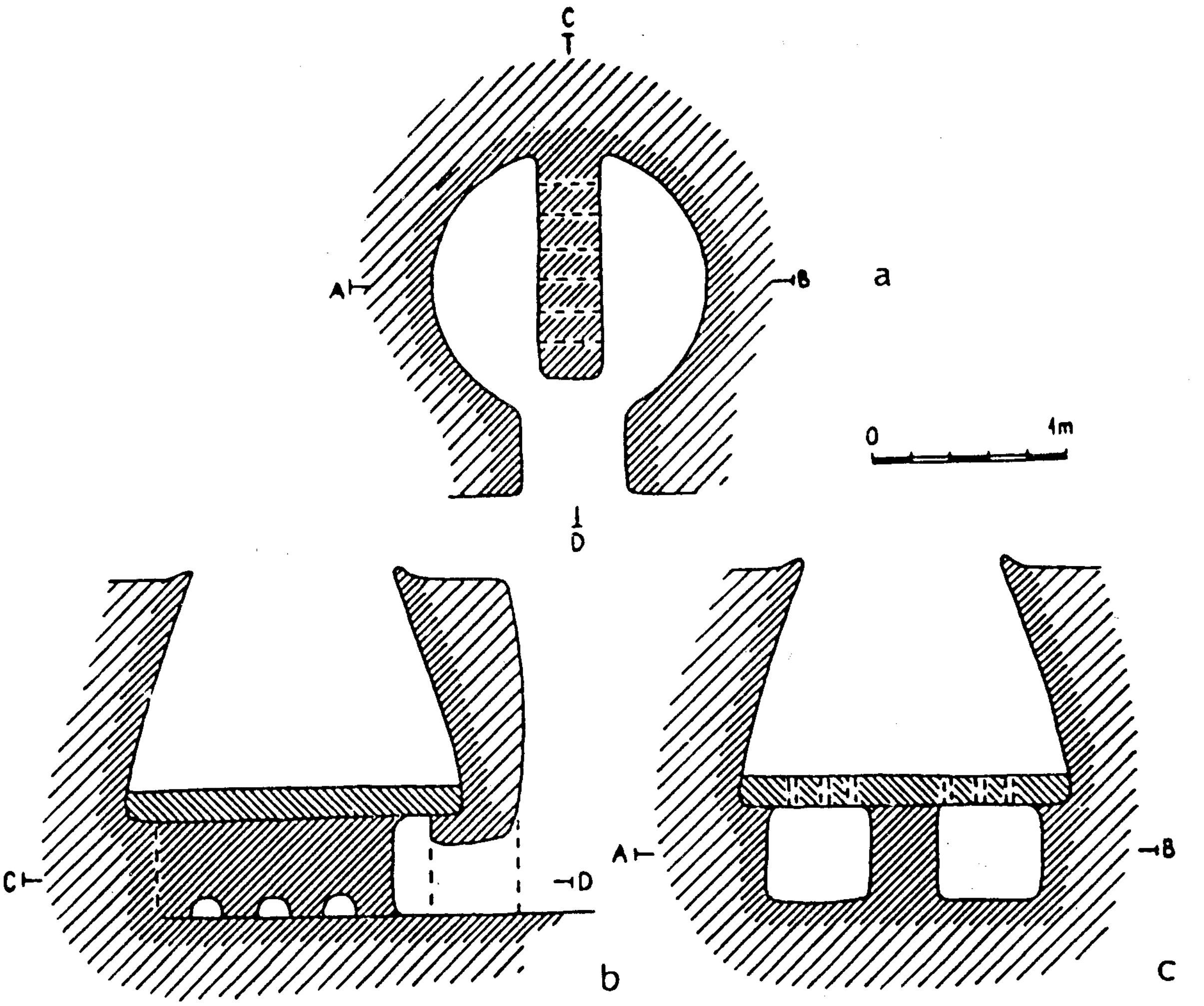


Fig. 57 Kiln from Glăvăneştii Vechi (top - a, side - b, and front - c views).

### LUKA VRUBLEVETSKAJA (Tripolye A)

A complex kiln of a different variety was found at this settlemen having the dimensions 2.4 m (l) x 1.6 m (w) (fig. 58). The kiln had a broad and low opening with a small access; later the access had been enlargened. The broad, voluminous heating chamber was arranged concentrically around an arched central "pillar" which served as a support for a flat grate with heating vents or flues; the thickness of the grate was 6-7 cm, the diameter of the flues was 3-4 cm. This grate had subsequently collapsed into the heating chamber. At the opening of the fuel access, a roof or vault of clay was preserved. Here and there on the vault was noticed impressions of branches which had served as the framework for the construction of the clay vault. Judging by the intensity to which the walls of the construction were fired (in some places the fired stratum reached 16-17 cm), the kiln wa used for a substantial period of time (Bibikov 1953:127; 1949:130-131).

Thus, the kiln was composed of three parts: 1) a covered, elongated chamber where fuel was placed, 2) a circular heating chamber, and 3) an upper chamber for the pottery (not preserved), which was formed by the placement of the grate. This upper chamber, according to the excavator, was most probably covered by a temporary dome or vault with a vent or chimney (Bibikov 1953:127).

### SINEŠTY (SINEŞTI) (Tripolye B II)

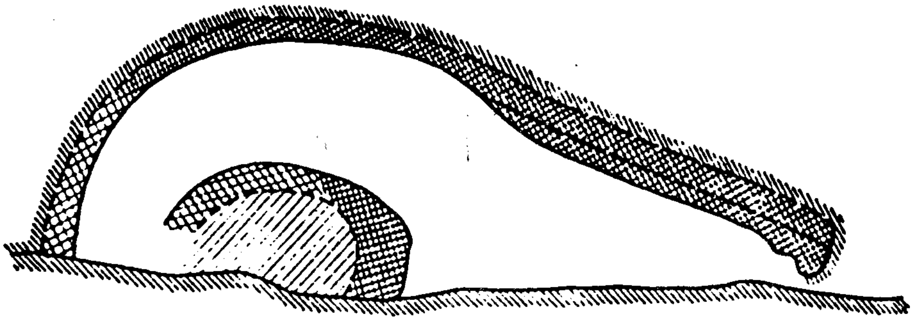
G. P. Sergeev found fragments of grates, perforated with ventilation holes (flues) (mentioned in Markevič 1981:131; Bibikov 1953:128).

### VARVAROVKA VIII (Tripolye C I)

A simple kiln was found in a pottery workshop--structure no. 3 (fig. 58). It was rectangular in ground plan and trapezoidal in cross-section. The walls are partially preserved. Dimensions are 1.80 m (l) x 1.55 m (w) x 1.00 m (preserved height); the height of the front opening varied between 0.65 and 0.70 m; the wall thickness is 10-12 cm at the base and 6-8 cm at the apex. The walls were constructed of clay tempered with crushed sherds and were burnt to a bright red color throughout. The foreplace is constructed of clay with an admixture of sand; the dimensions are 0.90 m (l) x 0.35 m (w) x 0.15 m (d). The base of the kiln is also made from a clay-sand mix 3 4 cm thick (Markevic 1981:131). This kiln can be positively identified as such by the existence of dozens of whole and broken vessels in the vicinity as well as numerous kiln wasters (i.e. fused ceramic and glassy material) found nearby (Markevič 1981:23-24).

### KOSZYŁOWCE-OBOZ (Tripolye C I)

The remains of 18 simple, cupola-shaped kilns, constructed of clay, were discovered by K. Hadaczek just before World War I. Inside the kilns and in the immediate vicinity was an enormous quantity of painted and incised vessels. Also found were numerous anthropomorphic and zoomorphic figurines of clay, clay loom weights and whorls, tools and weapons of flint, bone and horn tools, as well as isolated copper and silver objects (Ebert 1926:56, pl. 25a).



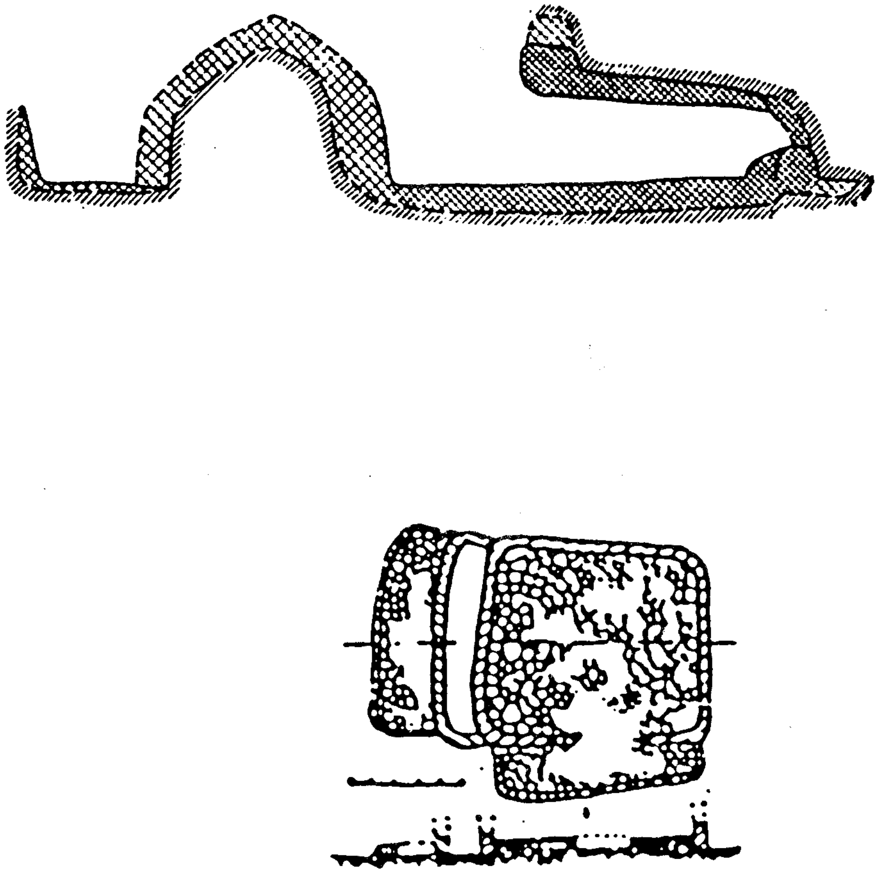


Fig. 58 Kilns from LUKA VRUBLEVETSKAJA (top) and VARVAROVKA VIII (bottom).

## KOSTEŠTY IX (COSTEŞTI) (Tripolye C)

An up-draught kiln was found in excellent condition, the northeast part of which was destroyed by an Early Iron Age pit (fig. 59). The construction of the kiln began with the digging of a round foundation pit leaving an earthern median support wall protruding, measuring 18-20 cm (w) x 140 cm (1). This support wall for the grate was plastered wit a 15 cm-thick layer of clay-sand mixture on both sides. The northern end of the support is cut off obliquely before reaching the kiln wall. The support was pierced by vertical flues in the form of truncated cones, the lower ends of which opened into the firebox.

In order to construct the grate, branches and twigs 30 cm in lengt were wedged into the wall of the kiln; the protruding parts were covere with clay, forming cones. After the clay covering the twigs had hardened, the grate was formed by the packing of clay in the interstice When completed, the grate was faced, both above and below, with additional layers of clay. The average thickness of the grate was 20-22 cm; the diameter was 173-175 cm. During construction, the grate was perforated with flues.

In the upper firing chamber, were found fragments of an "altar" and large, painted sherds dating to Tripolye C (Markevič 1981:49, 132).

## ŽVANETS (Tripolye C)

As of 1974, seven up-draught kilns were found at the boundary of the settlement and appear to have been arranged in rows. The kilns in the first row were partially destroyed by modern-day quarrying; of these, the floors and fireboxes of kilns 4 and 5 escaped destruction. The kilns of the second row, nos. 1, 2, part of 3, and 7, were well preserved and were situated considerably to the north of the rest. Kiln no. 6, in all probability, formed part of a third row. The kilns were either horseshoe-shaped in ground plan or were rectangular with rounded corners. All were up-draught kilns, with the firebox divided in half by a median support wall for the grate. The kiln walls were of clay tempered with vegetal material. The two lower firebox chambers were arched or triangular in profile (fig. 60).

Kiln no. 2 was preserved to a height of 47 cm. The walls were arched so as to conjecture a cupola or truncated conical shape for the upper firing chamber, with vessels being loaded into the kiln from above. During the course of excavating this kiln, it appeared to the excavator that there were holes in the arched walls, plugged by wooden pegs or blocks which themselves were plastered with clay; above these pegs were lain broken sherds. Presumably, this was a temperature/atmosphere control procedure.

Kilns 1, 2, and 3 had wasters of Late Tripolye ceramics. Kiln no. 2 was found filled with Tripolye C pottery (Movša 1971; 1975).

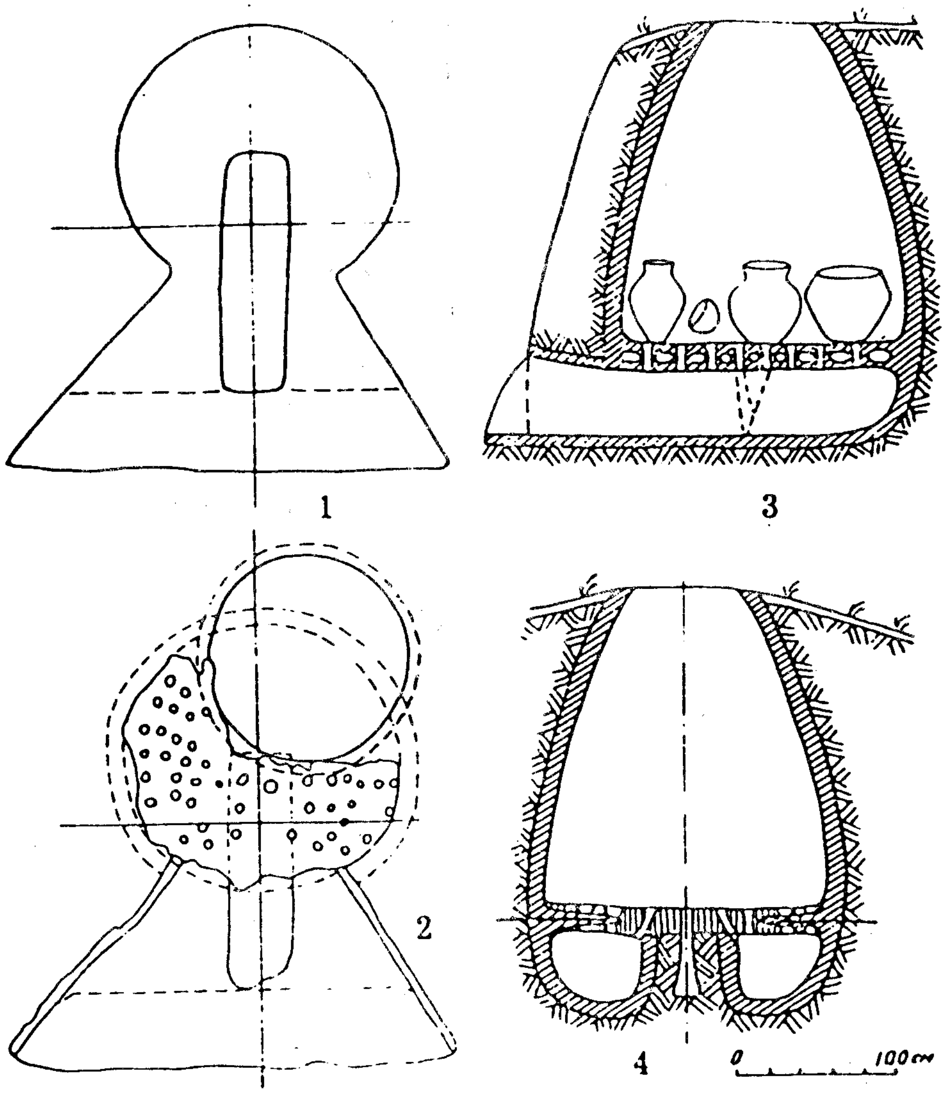


Fig. 59 Kiln from Kostešty IX (Costeşti).
(1 - plan, 2 - top view of grate and Iron Age pit, 3 - side view, 4 - front view).

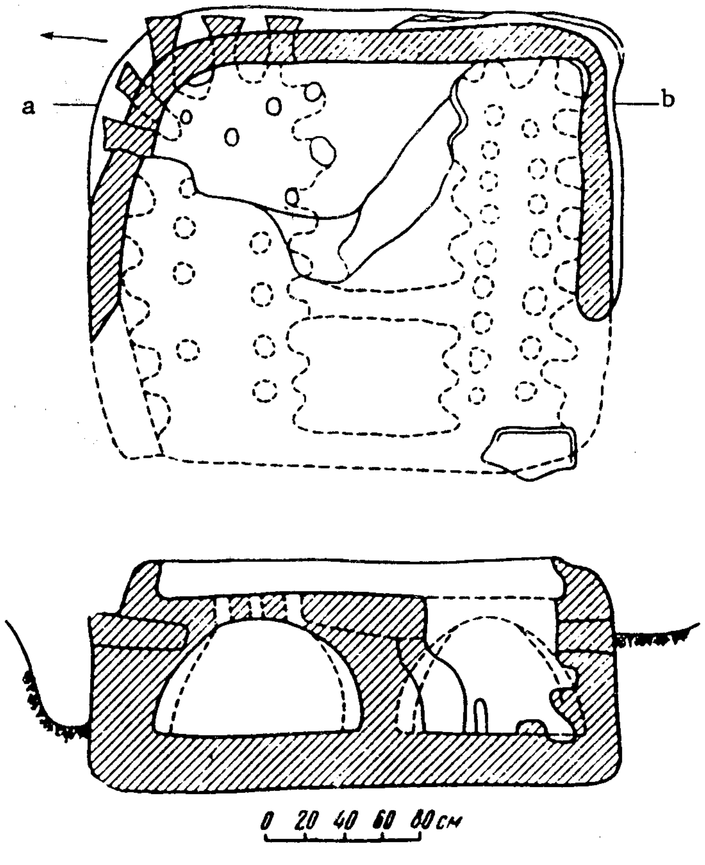


Fig. 60 Kiln from Žvanets (upper: top view of grate; lower: front view of firebox).

### III.C.2. Atmosphere control and firing temperatures

By exploring the very early types of kilns used by Neolithic cultures surrounding the Cucuteni-Tripolye zone and, subsequently, by discussing the up-draught kilns used by Cucuteni-Tripolye potters, we may appreciate more the evolutionary development and growing complexity of pyrotechnological operations during the Chalcolithic.

As was mentioned before, one of the main advantages of using kilns in pottery firing is the greater control over reduction/oxidation conditions. So far no kilns have been found in the Pre-Cucuteni (=Tripolye A) context in Romania and only one kiln has been found in the Ukraine at Luka Vrublevetskaja. The lack of control over gaseous by-products of combustion is clearly evident in the ceramic inventory from this early period: The clay matrix of this pottery was fired to various nuances of brown and grey indicating the presence of mixed gases and insufficient oxygen to combust the fuel.

However, during the process of adoption of new technological ideas from central Transilvania, Cucuteni-Tripolye potters learned how to manipulate their firings so that completely reducing and completely oxidising atmospheres could be attained. More specifically, they learned from the Petreşti culture that 1) clays could reveal different colours other than brown or grey on a consistent bases, 2) draught conditions could determine the clay colour, and 3) draught control and clay colour could be manipulated and exploited as part of decorative technology. After mastery of a good oxidising kiln atmosphere had been accomplished during the Cucuteni A (=Tripolye B I) period, the use of a reducing atmosphere to produce a black clay matrix was abruptly abandoned shortly after the transmission of painted ware technology across the Carpathians into eastern Romania, since sherds of black ware are quite rare in Moldova.

The attainment of high firing temperatures is no less a consideration for prehistoric potters, since it is this factor that enhances the quality and durability of the final product especially with regard to food storage (cf. chapter IV).

The evidence from X-ray diffraction analyses of the black slips (table 19) indicates that Cucuteni-Tripolye potters were able to attain, and probably exceed, firing temperatures of 1000°C beginning with the Cucuteni AB (=Tripolye B II) period and on a regular basis during the Cucuteni B (=Tripolye C I) period. This conclusion is based on the fact that manganese oxides convert to the high temperature mineral phase hausmannite ($Mn_3O_4$) beginning at 1000°C (Muan and Somiya 1962). As opposed to other manganese oxides, hausmannite as a naturally occurring mineral does not occur frequently and would be indistinguishable from other black manganese minerals in the oxide zone; therefore, it is unlikely that this mineral would be singled out by ancient potters from such disparate settlements as Tîrgu Ocna-Podei, Tell Poduri, Bilcze Zlote, and Ghelăieşti where hausmannite has been detected in the slips. Thus, it appears more logical to view the problem as a growing control and attainment of higher firing temperatures. This view is not unreasonable if one keeps in mind that 1) hausmannite has never been found during the Cucuteni A (=Tripolye B I) period (Ellis 1980; and cf. table 19 this work); 2) the earliest occurrence of this high temperature mineral has so far only been during Cucuteni AB (=Tripolye B II) at the site of Ghelăieşti; and, 3) the occurrence of hausmannite during Cucuteni B (=Tripolye C I) ha been detected at Bilcze Zlote (Stos-Gale and Rook 1981), Tell Poduri, Ghelăieşti, and Tîrgu Ocna-Podei (table 19) at which time much high quality pottery with a compact and ultra-fine matrix occurs.

As additional support for the attainment of high firing temperat Cucuteni A samples from Tîrgu Bereşti and Cucuteni AB and B samples f Ghelaieşti were examined with a scanning electron microscope (technic details are given in the captions to figs. 65 and 66). Fragments of individual sherds were re-fired in air at 100°C increments in tubular furnaces and compared to sherd fragments showing the original structu (methodology is outlined in Tite and Maniatis 1975). The samples fro Bereşti (fig. 66) and Ghelăieşti (fig. 65) were re-fired to a maximum of 1000°C and 1100°C, respectively, and show a continuous vitrified structure. But what is interesting is that when these re-fired sampl are compared to the original surfaces, the latter also show partial, i not extensive vitrification and elongated pores, which indicates that sufficient temperatures could be reached to form an continuous glass phase.

Information on the types of fuel is not plentiful. Only one kil has had the remaining charcoal identified: The kiln at Vădastra (*supr* was found to contain charred oak. But this site of the Gumelniţa culture is located far to the south of the Cucuteni-Tripolye culture. In 1983, this author and Mr. Dan Monah of the Neamţ County Museum Complex conducted an ethnographic interview with a retired potter, Mr. Ion Cucoş, who is now in his eighties and living in the village of Cernu (district of Poduri). Mr. Cucoş gave some insight into the use various woods used as fuel for oxidised wares: He stated that the *roots* of the tree, rather than the upper trunk or branches, were preferred for fuel for two reasons: First of all, roots fire at a higher temperature than wood (no specific temperature could be given, since this was based on empirical observation of the flames); the second reason for the use of roots was in the interests of economy. And for red (i.e. oxidised) wares produced between 50 and 20 years ago in this district, the lower firing temperature of roots from the popla tree was preferred over the higher temperature possible from roots of the beech tree (*Populus*, sp. and *Fagus*, sp., respectively). Of course, this ethnographic information cannot be proven to be reflective of prehistoric events *in fact*. But, *in principle*, two items of informatio are quite relevant: First, different firing temperatures could be attained and could be empirically observed not only among different species of trees but also among the different parts of the tree; and secondly, considering the huge quantities of wood necessary in building construction as well as in fuel consumption, roots could have been used in pottery firing in the interests of economising labour and materials as well as being preferred for the higher temperatures attainable.

## III.D. Conclusion

In this chapter, the entire ceramic manufacturing sequence has been presented:

1) the geological nature of the landscape and the raw materials available to prehistoric potters;

2) forming processes, including clay preparation, vessel formation, and decoration; and,

3) firing processes, including the use of kilns, atmosphere control and firing temperatures attained.

This concluding section will discuss some of the directions along which technological skills progressed and some of the organisational considerations of pottery manufacturing.

During the Pre-Cucuteni/Tripolye A period, ceramics varied considerably in terms of clay preparation, decoration and firing. Clay was tempered with pulverised sherd material in highly variable amounts. The clay itself is characterised by a larger ratio of coarse fraction to fine clay matrix and the average size of natural inclusions is greater than in succeeding periods (cf. tables 6-18). The early ceramics were fired in pits in uncontrolled atmospheric conditions which caused the color of the clay to turn various shades of brown and/or grey; the duration of firing was relatively short, since dark brown or black "cores" are still present in many sherds, indicating insufficient penetration of oxygen.

In contrast to the earlier incised/excised ware is the painted ware of succeeding periods. Once pre-fire painting had been mastered, no changes occurred in the basic decorative technology for the continuation of the Cucuteni-Tripolye sequence. With the adoption of slip painting, however, immediate changes were made in clay preparation: The use of temper was abandoned and either clays were refined through levigation or were carefully chosen for their low coarse fraction. Both clay preparation and the firing procedures (including atmosphere and temperature control and even kiln construction) were consistent through time.

It is suggested here that because the earlier (Pre-Cucuteni/Tripolye A) ceramic technology was operating on a less sophisticated level and with a high degree of variability in terms of clay consistency, amount of temper, firing conditions, etc., ceramic manufacturing activities were at the household level of production. However, this pattern of production changes with the advent of the painted ware sequence: There is less variation in all aspects of pottery manufacturing; similar requirement for past consistency, types of mineral pigments, and firing techniques existed synchronically and diachronically in the Cucuteni-Tripolye zone which gives the impression that certain production standards were in effect on a regional scale. This idea of regional product standardisation is reinforced when one considers 1) the evidence for the use of a simple wheel or turntable; 2) the reduction in vessel types and increase in large biconical pots of similar form and size; 3) the appearance of series of pottery kilns at several sites; and

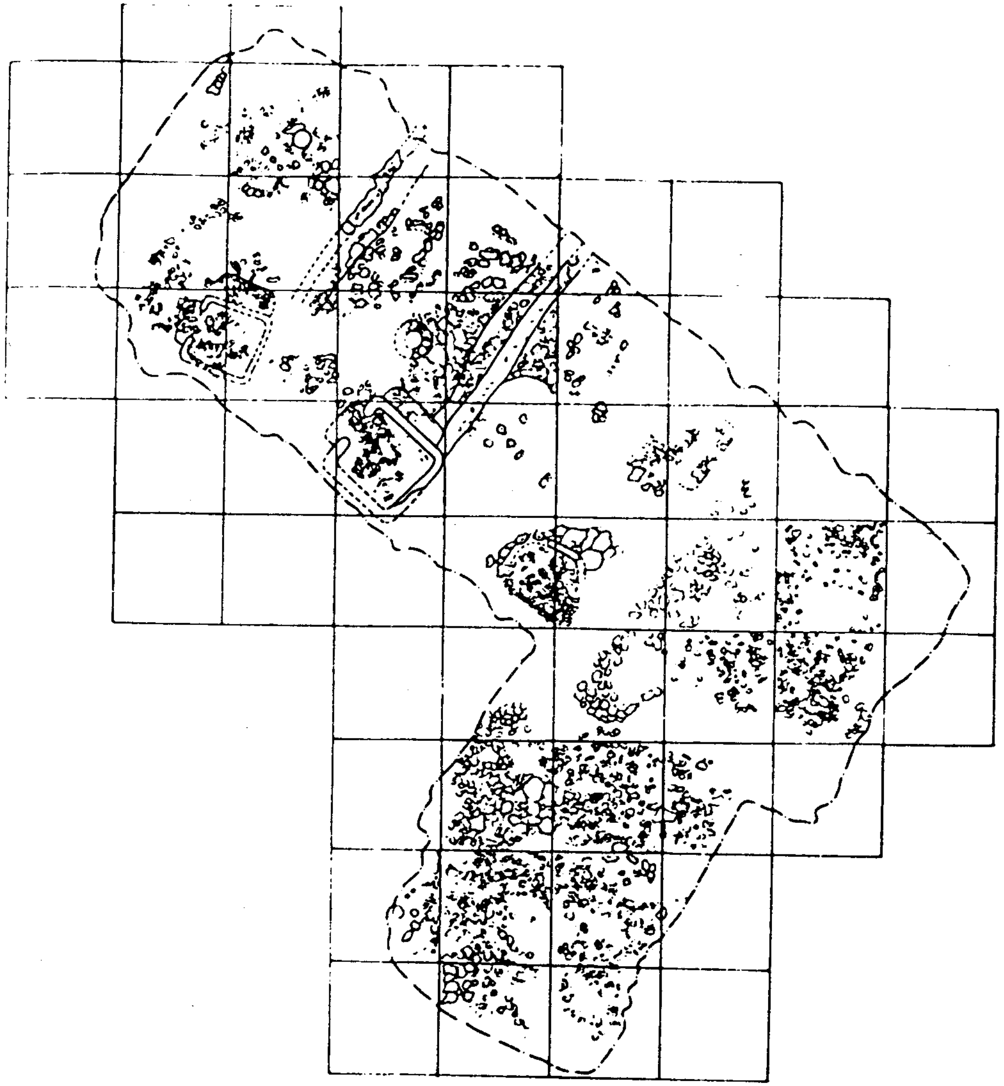


Fig. 61 Excavation plan of pottery workshop from Varvarovka VIII.

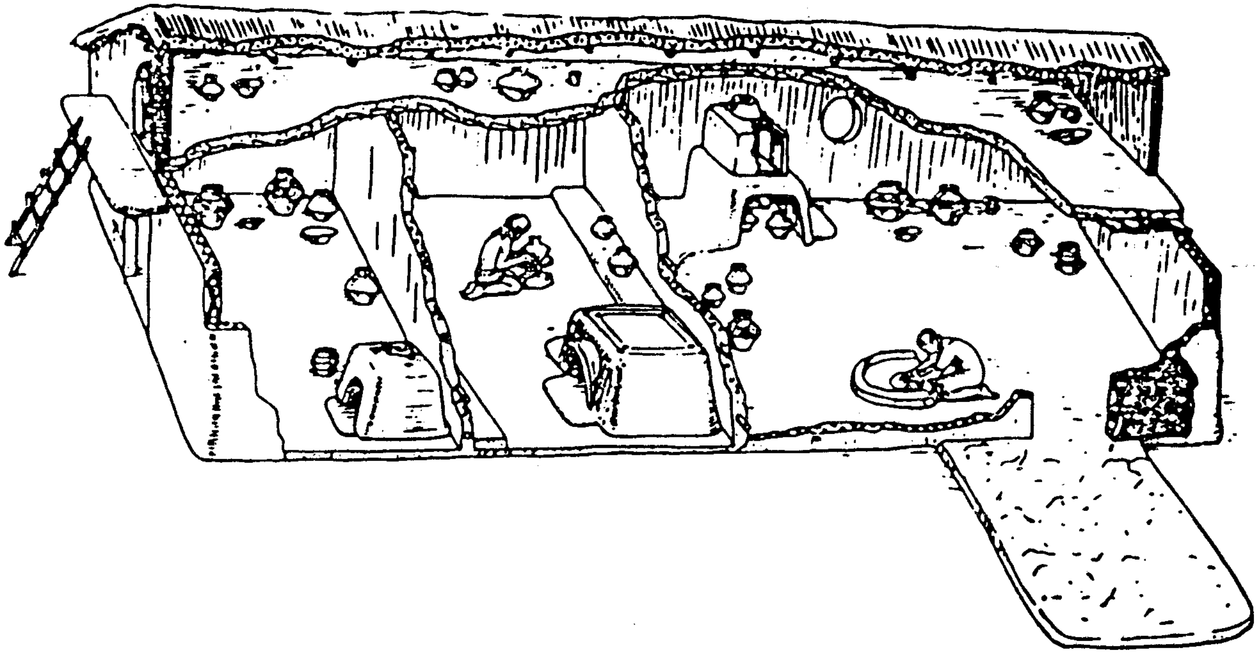


Fig. 62 Reconstruction of pottery workshop from Varvarovka VIII.

4) the appearance of two-storey structures used exclusively for potte manufacturing.

These two-storey structures were a phenomenon first recognised b V. Markevič (1981) at his excavations at the site of Varvarovka VIII i the Moldavian SSR. Building no. 3 (figs. 61, 62)--a two-storey building--was designated a pottery workshop on the basis of the unusua number of finds associated with ceramic production: a loft and other shelves for drying pottery, polishing tools, slabs for grinding minera pigments, various ovens and a kiln with ceramic wasters, evidence for turntable or wheel, and next to the building was a pit with a large accumulation of ochre (Markevič 1981:127 ff.).

Even more intriguing are von Stern's excavations at Petreny (Petreni) at the turn of the century, now also in Soviet Moldavia (von Stern 1907, 1929). Eight buildings, all but one measuring 10-14 x 5-8 m with the other building measuring 14 m x 14 m, were excavated on the outskirts of the main settlement. Von Stern believed, based on his excavation results, that these were two-storey buildings and he wa also convinced that these structures served some cultic or religious significance, since he failed to find any hearths, food preparation materials, or work-a-day tools and utensils. What he did find was tha these structures were virtually packed with ceramics--in some instance as many as seven bowls were found one inside the other--such that sometimes one literally could not move around freely (von Stern 1929:44 However, von Stern's interpretation of the finds was that these buildings represented a type of memorial where one would place sacrifices to the dead and he even called them "houses of the dead". Occasional charred food remains and some "calcified" animal bones were cited as the main evidence for this theory, together with the lack of other utilitarian objects and hearths.

Von Stern's ideas were, and still are, highly controversial, especially since only one cemetery has been found in the entire Cucuteni-Tripolye zone and researchers still do not know what the standard burial ritual was for these people (cf. chapter IV). However, the excavations at Petreny (Petreni) appear quite acceptable and the detailed information derived therefrom is very useful for the purposes of this work. What was so confusing to the excavator, and other archaeologists at the turn of the century, was why these eight buildings stood so close together and away from the settlement, why there was no usual occupation debris, and why so many vessels (large biconical vases as well as bowls and medium-sized pots) were stacked inside and sometimes with rows of vessels all along the walls. One alternative hypothesis might be that these buildings served as food storage; however, although some charred food remains and some animal bones were found, it appears that a vast majority of the vessels (no specific numbers available) were empty. In addition, food storage buildings which have already been found are small and located next to long-house dwellings in the interior of the settlement, not on the outskirts (cf. chapter IV).

It is therefore proposed here that what von Stern found was a pottery manufacturing district, and it would not be improbable to speculate that some kilns might have been nearby, since any kind of pyrotechnological operations would have been a fire hazard (note the

Table 21 Organizational characteristics of ceramic production at the household industry level and workshop/village industry level. (From: van der Leeuw 1977)

| Variables | Household Industry | Workshop/ Village Industry |
|---|---|---|
| time involved | part-time | part-/full-time |
| number involved | several | several |
| locality | sedentary/itinerant | sedentary |
| hired hands | none | some |
| market | group use | town/regionwide |
| raw materials (location) | | |
| clay | local | neighborhood |
| temper | local | neighborhood |
| water | local | local |
| fuel | local | neighborhood |
| investments | none | some |
| seasonality | season without other work | all year/good weather |
| labor division | none | some-considerable |
| time involved per pot | high | medium-low |
| status | semispecialist | specialist |
| manufacturing techniques | hand/small tools | mold/wheel |
| tools: sed. basin | none | when needed |
| wheel | none; rotary support | various kinds |
| drying shed | none | needed |
| kiln | open firing | (semi-)permanent |
| raw materials (types) | | |
| clay | wide range | narrower range |
| temper | wide range | narrower range |
| fuel | wide range | narrower range |
| Examples: (Cucuteni-Tripolye) | incised/excised ware | painted ware |

locations of kilns at the sites of Glăvăneştii Vechi, Drăguşeni, and Žvanets, supra)--this would account for the isolation of these buildings.

Recent aerial photography has revealed the entire settlement of Petreny (Petreni) which is now known to have comprised 498 buildings arranged in tightly concentric rings (cf. chapter IV). It is doubtful that von Stern knew how large this Tripolye C settlement was; but given the number of inhabitants who had to have been supplied with pottery, the theory of a craft manufacturing district just presented here does not seem unreasonable.

In conclusion, van der Leeuw (1977) has outlined some defining characteristics of pottery-making at various levels of organisational complexity from household production to large-scale modern industry. The criteria for a "household industry"--which would supply a small village, and for a "workshop/village industry" which would serve a small town or even the surrounding region is repeated here (table 21), since van der Leeuw's criteria appear applicable to the production patterns outlined above for the Pre-Cucuteni/Tripolye A incised/excised ware and the Cucuteni-Tripolye painted ware, respectively.

## Figures 63-66

Fig. 63 Examples of Cucuteni A and Cucuteni AB pottery.
a - Cucuteni A, Frumuşica
b - Cucuteni A, Frumuşica
c - Cucuteni AB, Ghelăieşti
(Photographs by the author with permission of Dr. Ştefan Cucoş, Director of the Neamţ County Museum Complex.)

Fig. 64a Pre-Cucuteni sherds (petrographic samples POD II 1-left and POD II 3-right) from Tell Poduri.

64b Scanning electron micrograph showing typical structure of mica (centre) in a Cucuteni B sample from Ghelăieşti (=petrographic sample GH B 1, fig. 38). JEM-35C scanning electron microscope, 35 kV, 2000x.

Fig. 65 Scanning electron micrographs of Cucuteni AB sample from Ghelăieşti (petrographic sample GH AB 1, fig. 35).
a - original surface
b - re-fired to 1100°C for 1 hour.
Note continuous vitrification structure at right centre in (a).
JEM-35C scanning electron microscope, 35 kV, 1000x.

Fig. 66 Scanning electron micrographs of Cucuteni A sample from Tîrgu Bereşti (petrographic sample BER A 1, fig. 34).
a - original surface
b - re-fired to 1000°C for 1 hour.
Note continuous vitrification structure across surface in (a).
JEM-35C scanning electron microscope, 15 kV (a) and 35 kV (b); 1000x.

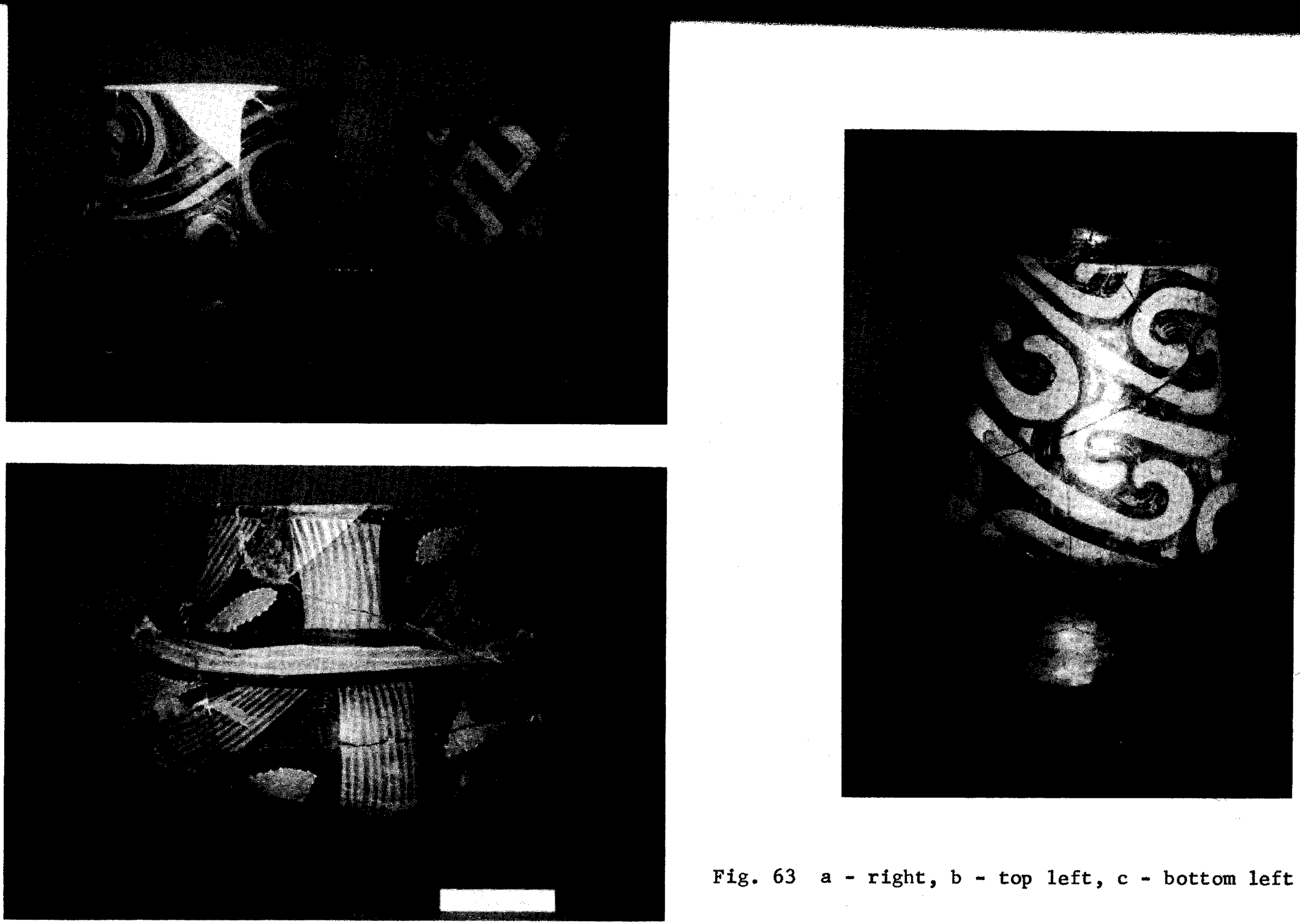


Fig. 63 a - right, b - top left, c - bottom left

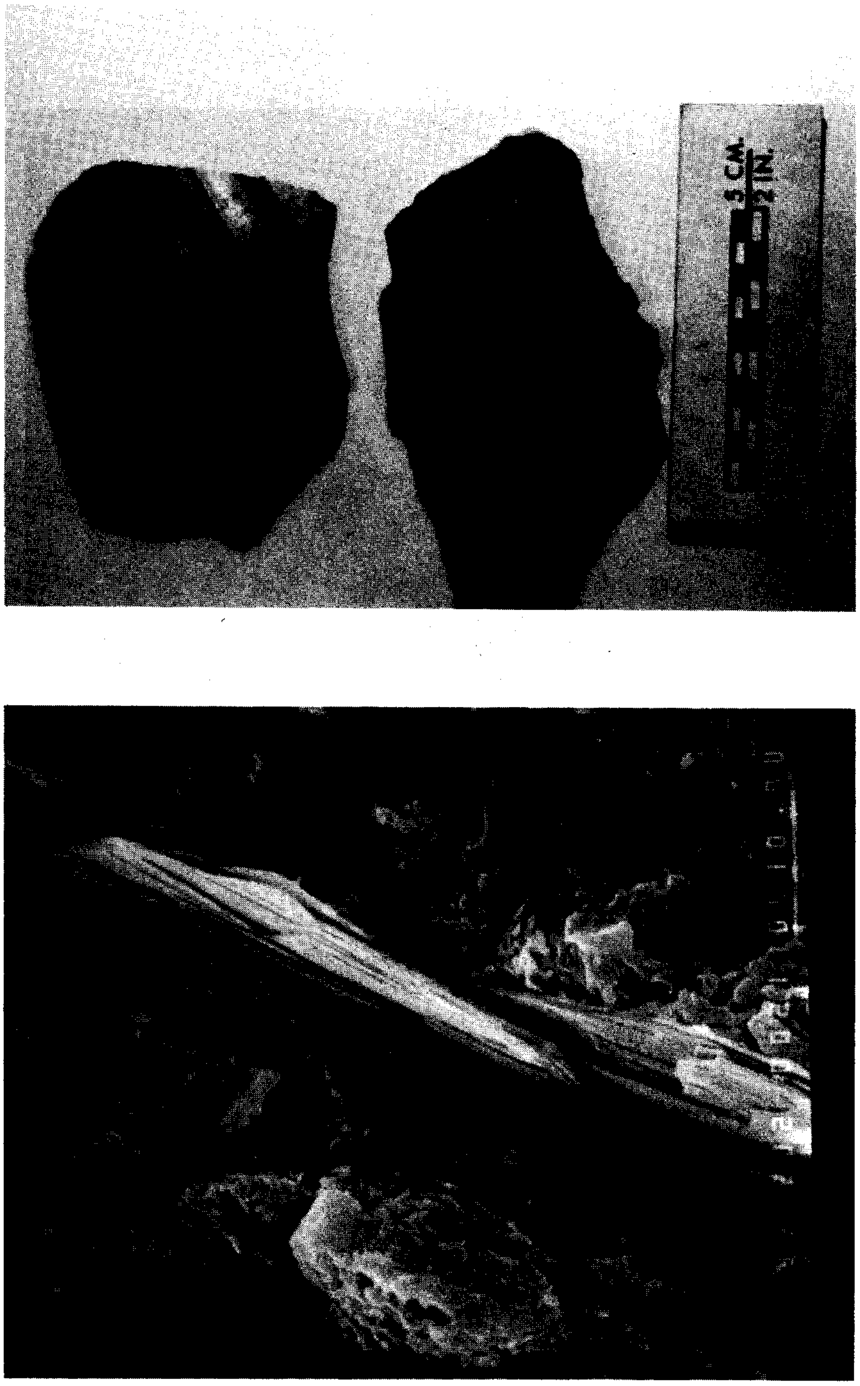
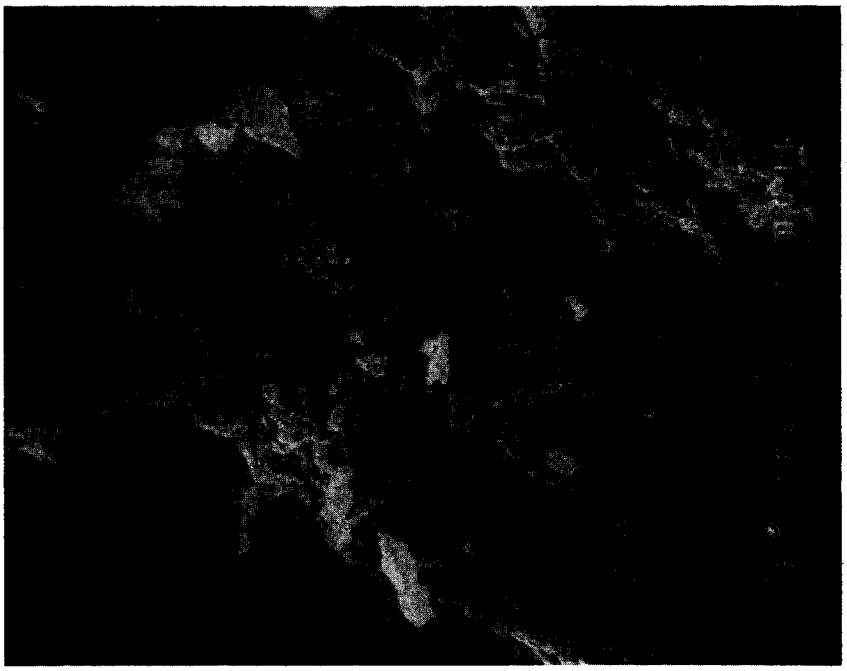


Fig. 64 a - top, b - bottom



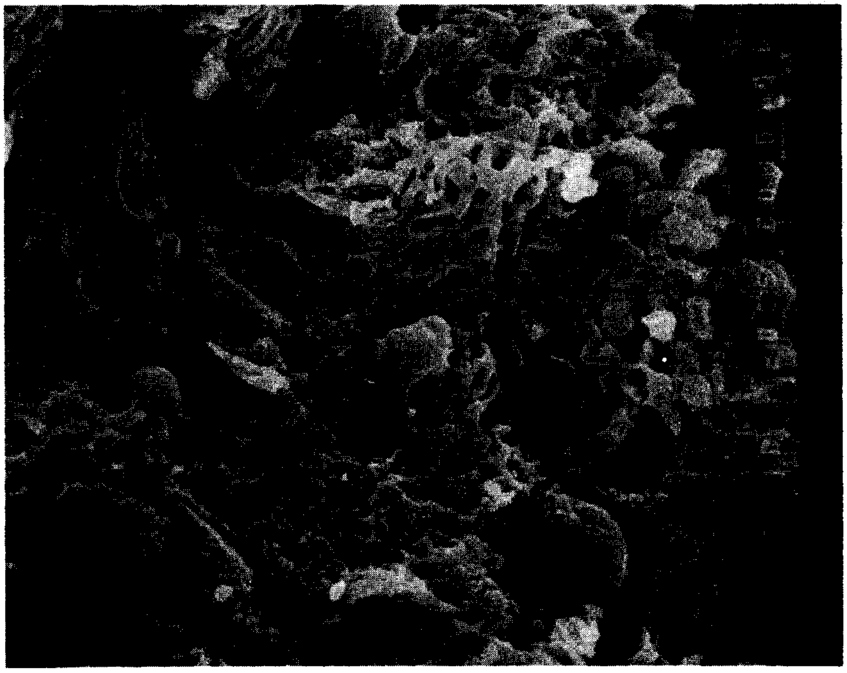


Fig. 65  a - top, b - bottom

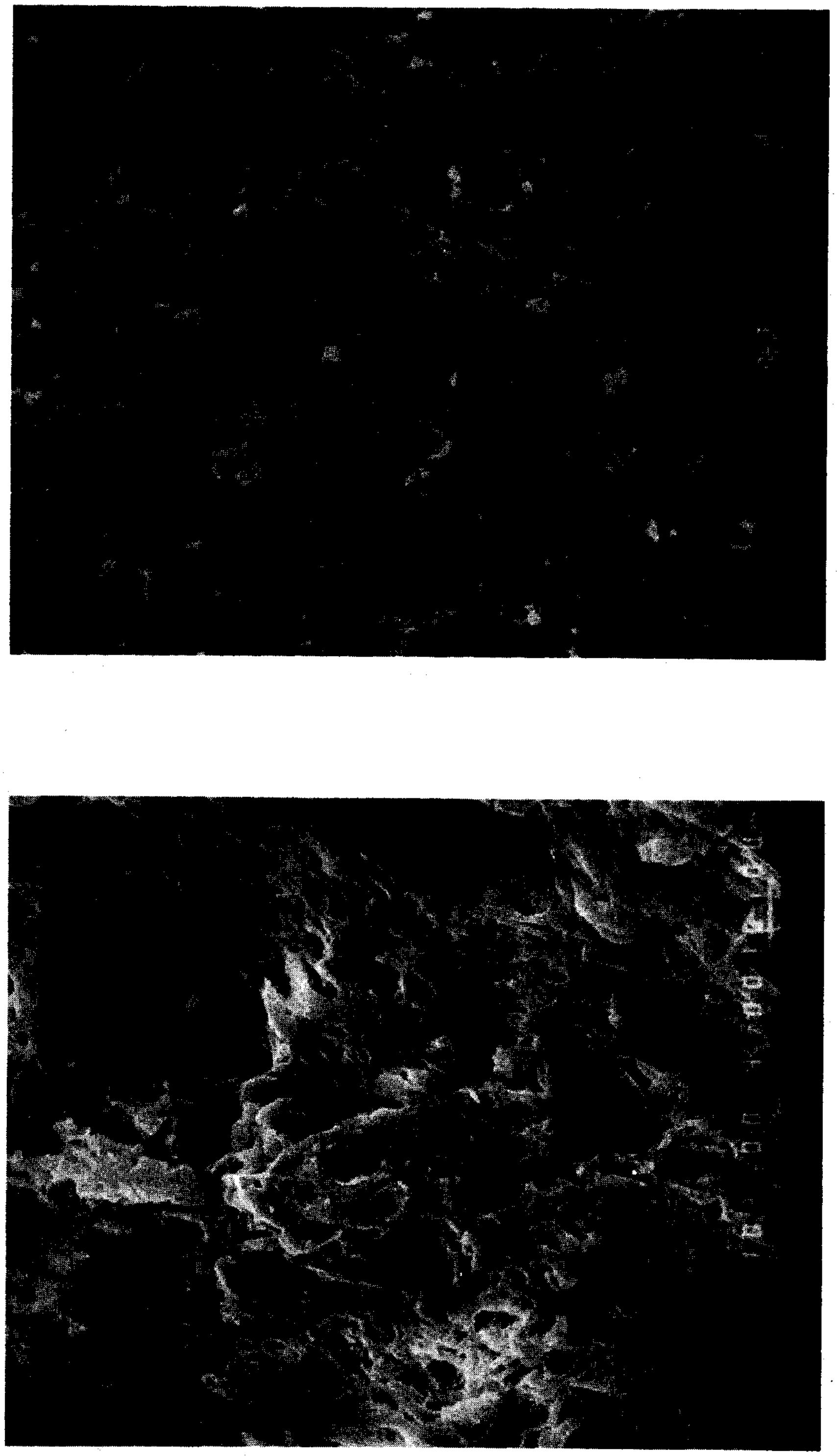


Fig. 66 a - top, b - bottom

# CHAPTER IV

## Conclusion:
## The Role of Technology in Socio-Economic Evolution

### IV.A. Introduction

In the first chapter, the long standing correlation of technological evolution with social evolution was presented as a concept worthy of re-examination and a topic ideally suited to the lengthy time frame offered by the archaeological record. The theme of the unilinear nature of technological evolution was questioned because of its lack of reality. The growth of technological complexity and its delayed effect in producing socio-economic change was also mentioned, and the Cucuteni-Tripolye culture was offered as an example of an early ranked society undergoing social and technological transformations.

The archaeological setting for the Cucuteni-Tripolye culture was surveyed in chapter II. The cultural origins of this population were traced; and, more importantly for the subject of this work, the origins of the incised/excised ware and the advanced polychrome ceramic technology were derived from the Boian and Linear Pottery cultures occupying southeastern Transilvania and from the Petreşti culture of central and southwestern Transilvania, respectively.

The ceramic typologies and relative chronologies were detailed at length in order to explore not only the diachronic but also the synchronic variation in ceramic decoration, since what was thought to be variability through time was actually variability across space. This spatial variation results directly from the organisation of manufacturing activities and is concomitant with the occurrence of sites with groups of pottery kilns or other evidence of a well developed ceramic industry. It was suggested that the chronological phases (e.g. Cucuteni "A2", "A3", "A4", etc.), as detailed in the footnotes to chapter II, have no significant diachronic value but instead represent interaction spheres wherein arose specific ceramic production centres whose manufactures attained a certain area of distribution as a result of intersite communication. The sites of Drăguşeni, Ariuşd, and Valea Lupului provide good examples where evidence for kilns has been found and whose ceramics (with their typological pecularities) have limited distribution. It was therefore suggested that only the basic chronologies offered by H. Schmidt and T. Passek should be used and that the subsequently formulated phases (i.e. "A2", "A3", etc.) should be considered the reflection of activities by various sites specialising in the manufacturing of certain types of ceramics.

Chapter II also made clear that despite the regional variations, the overall uniformity of the monochrome ware-together with the appearance of monochrome, trichrome, and the archaic incised/excised wares on Ukrainian settlements with a single occupation level--indicates an extremely rapid rate of diffusion of technological ideas and considerable intersite communication. And, finally, the dramatic changes in decorative technology and the rapid acceptance and diffusion of the monochrome ware was suggested as a reflection of increased efforts towards mass production.

Chapter III detailed the specifics of Cucuteni-Tripolye pyrotechnology. The geological landscape revealed that the Cucuteni-Tripolye culture occupied an area that formed part of the Black Sea during the Miocene and that this Moldavian-Skythian Platform consists of huge deposits of sedimentary rocks--prevalent among which are clays. The Eastern Carpathians (i.e. Bistriţa River region) were discussed for their excellent surficial deposits of black manganese oxides which could have been exploited for use in paints. The use of bog manganese ores across the Podolian Uplands and other parts of the Ukraine as another source of black pigment was also mentioned.

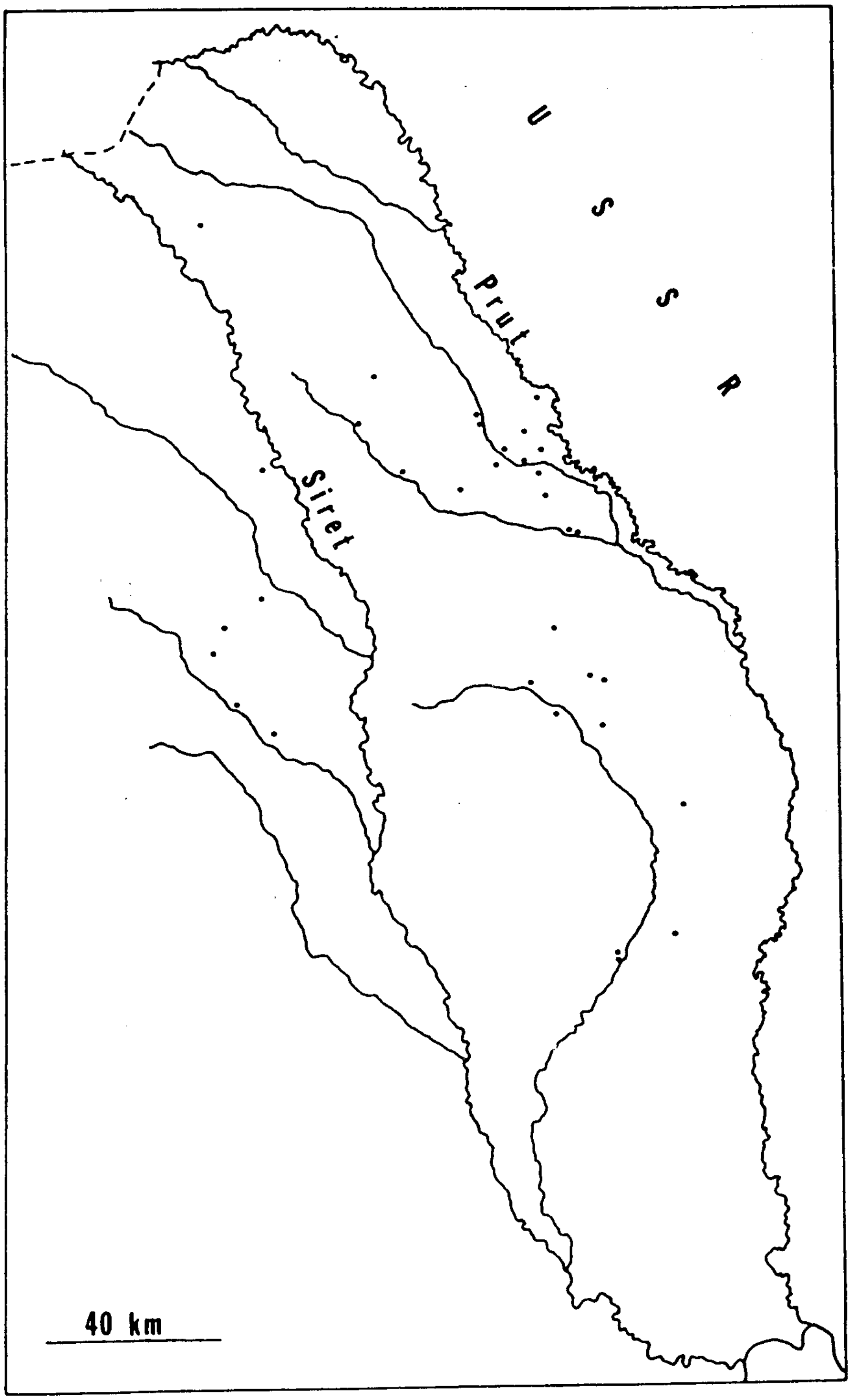
The analysis of sherds from eastern Romania through petrography and scanning electron microscopy, the X-ray diffraction analysis of slips, as well as results from analysis of museum collections in Romania and ethnographic analogy of recent pottery manufacturing in Romania were all combined in chapter III to present a unified documentary on the specific details of ceramic production, especially regarding the high degree of clay refinement, the manipulation and firing of clays without temper to temperatures up to 1000°C, the use of an early form of the pottery wheel, and the control over firing atmosphere together with the pre-fire application of slips in order to attain simultaneous red and black decoration. The first occurrence of complex, up-draught kilns in temperate Europe was documented, as well as the appearance of large, two-storey structures used solely as pottery workshops at dense population centres of Varvarovka VIII and Petreny.

This chapter will return full cycle to the premises discussed at the beginning of this work and attempt to answer the following questions What role does this technology have in socio-economic development? Is the relationship between technology and society unilateral or bilateral? If the latter applies, what is the effect of social and economic needs on technological development?

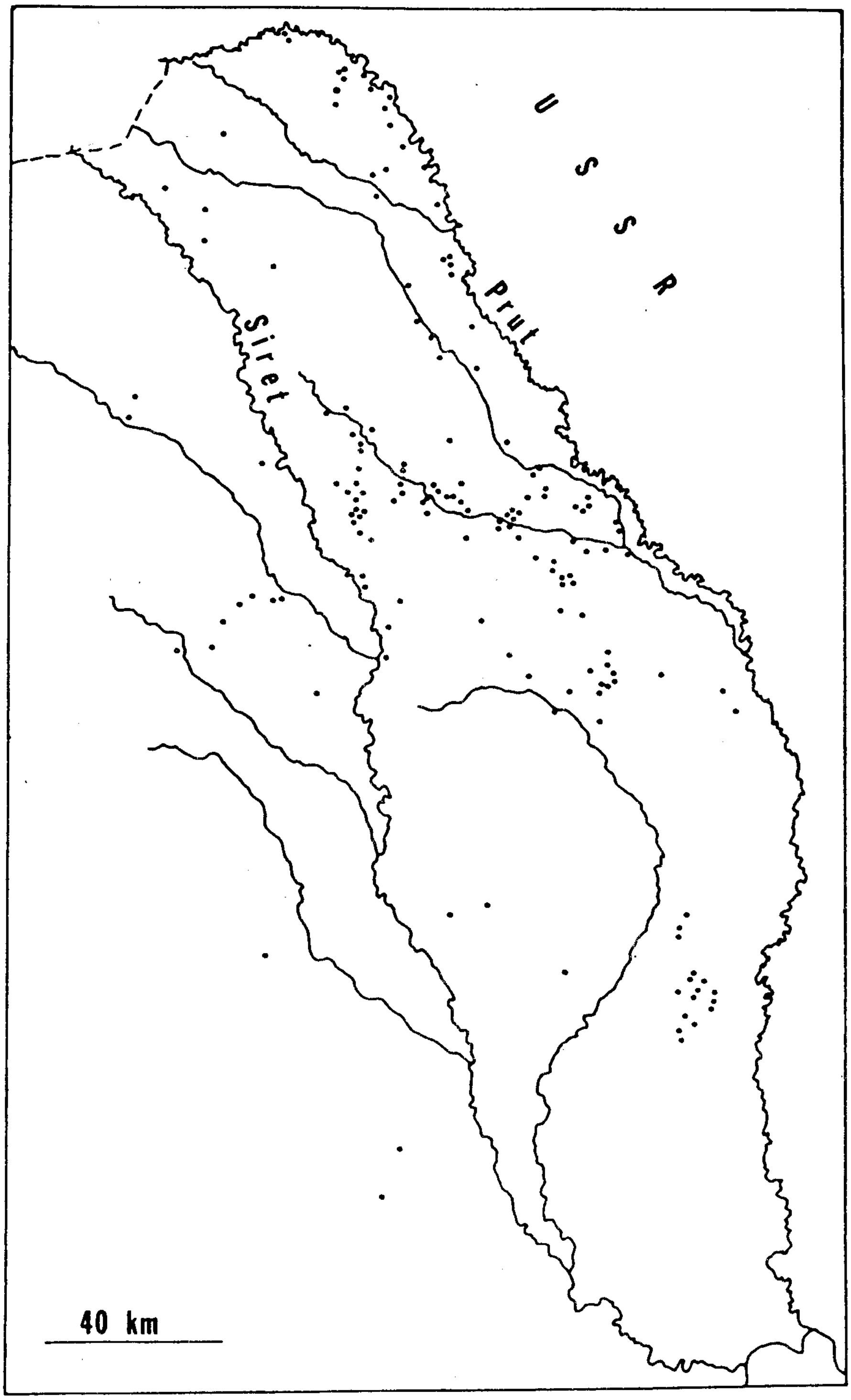
## IV.B. Palaeodemography and socio-economic evolution

In order to detect any impact of technology on society, it will be necessary first to assess the progress made in socio-economic development through time.

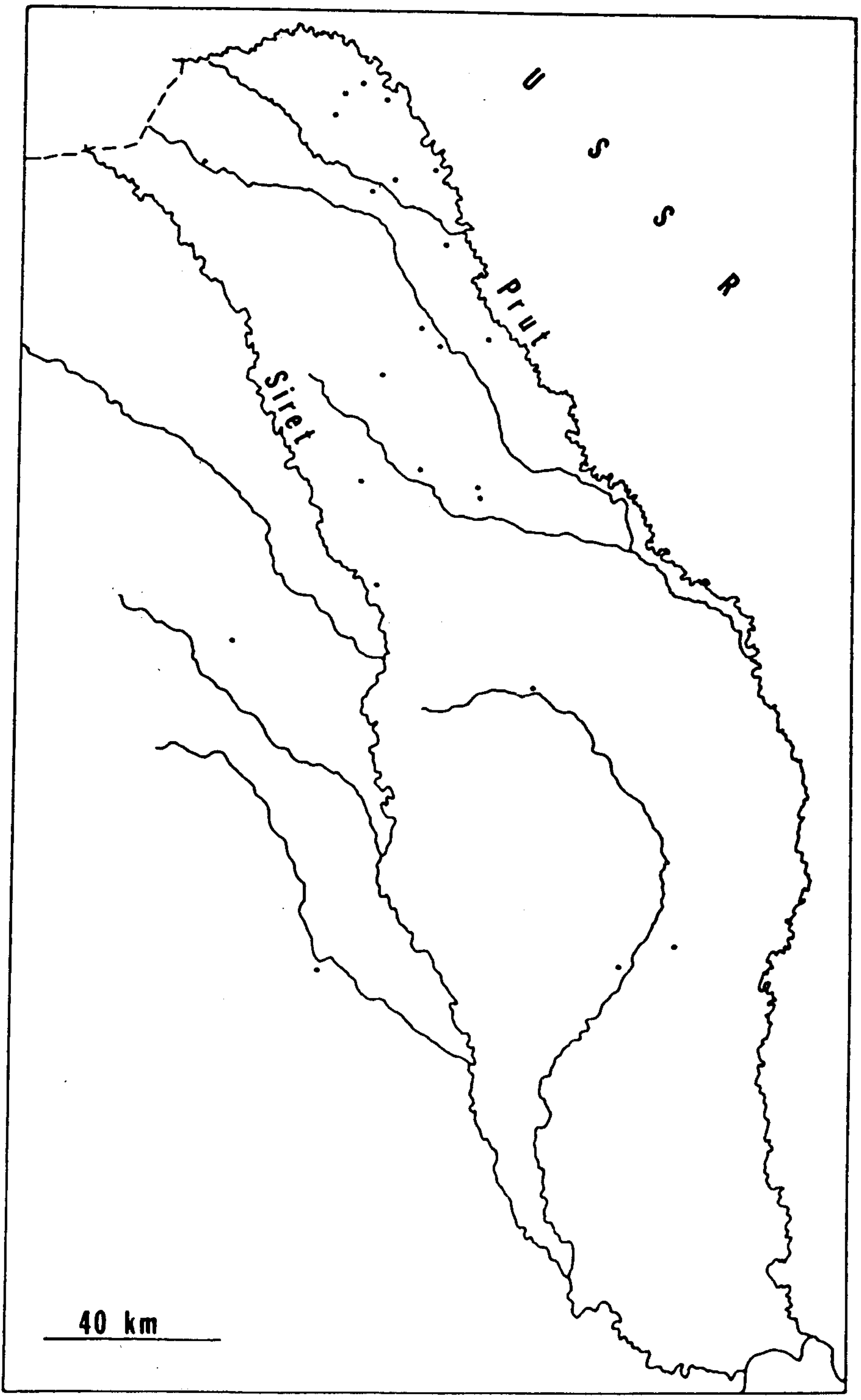
The 100 years of research on the Cucuteni-Tripolye culture have failed to bring to light consistent data on the burial ritual, since extra-settlement areas are seldom surveyed and excavated. Therefore, one of the most useful sources of information on social and/or economic relationships is currently unavailable. Only one very late (Tripolye γ II) cemetery, with 63 burials, 36 of whom are children 14 years of age or under, has been found at Vykhvatintsy in Soviet Moldavia (Dergačev 1978). The small quantities of utilitarian goods found with each burial fail to identify any individuals who had accumulated any



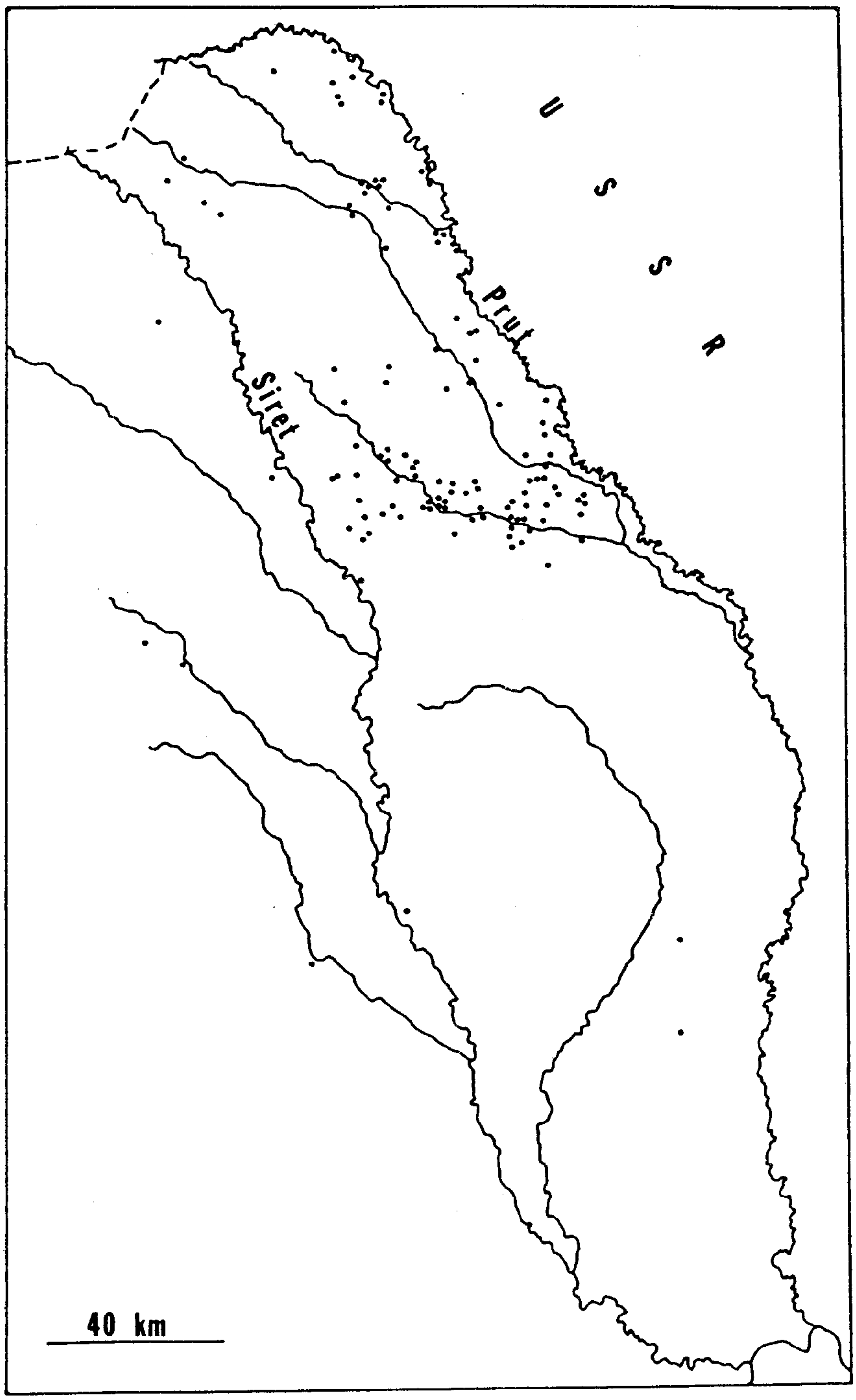
Map 15 Pre-Cucuteni sites in E. Romania



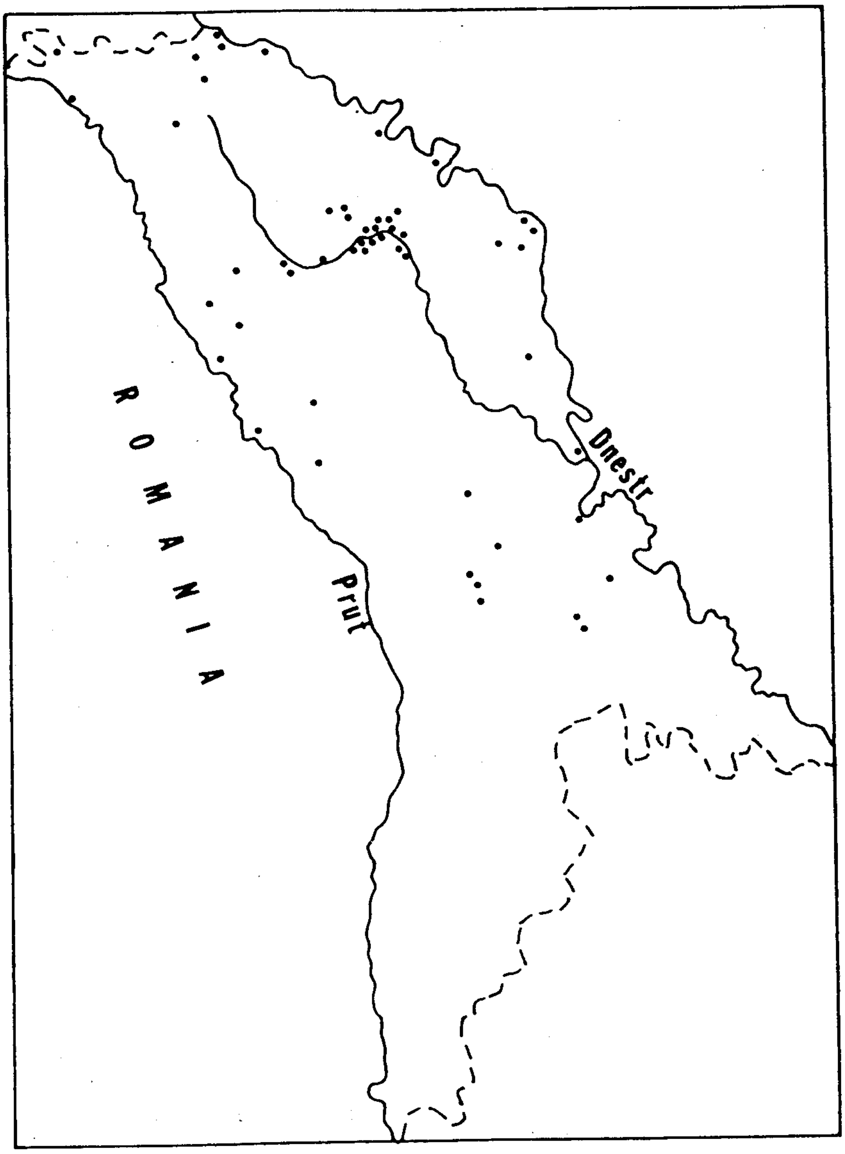
Map 16 Cucuteni A sites in E. Romania



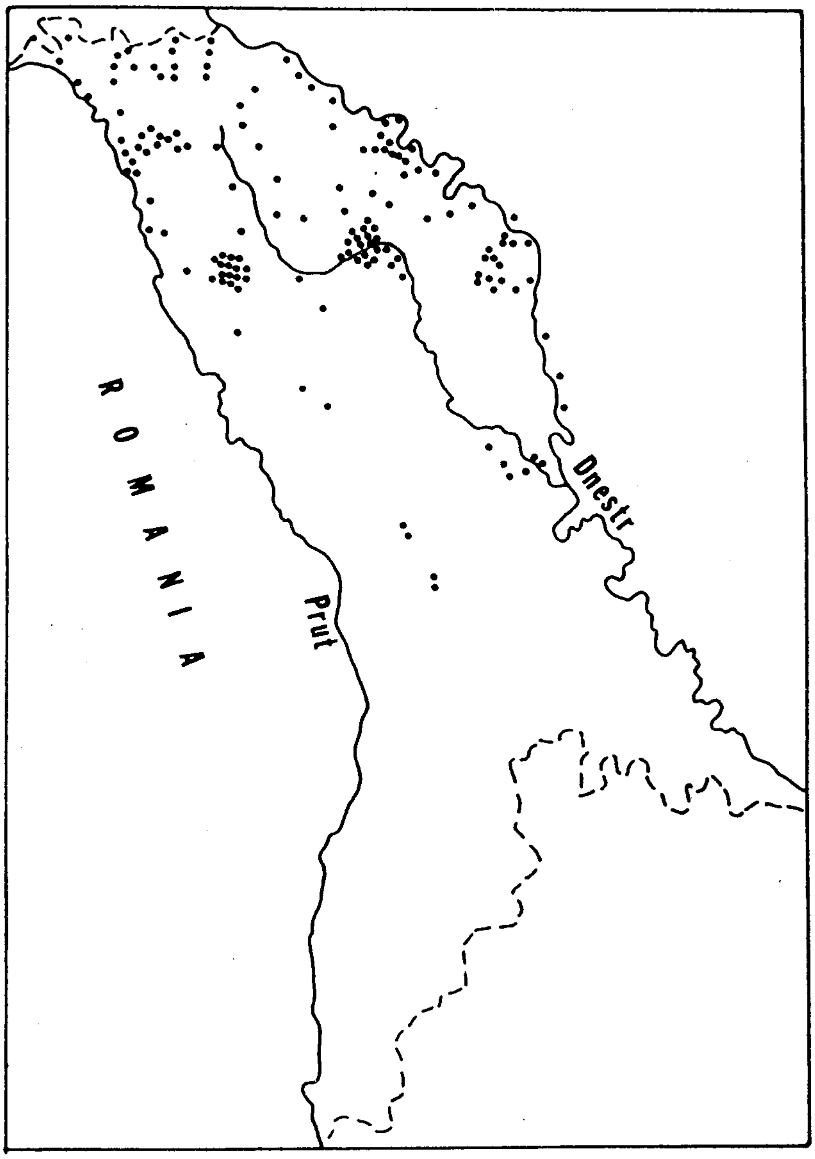
Map 17 Cucuteni AB sites in E. Romania



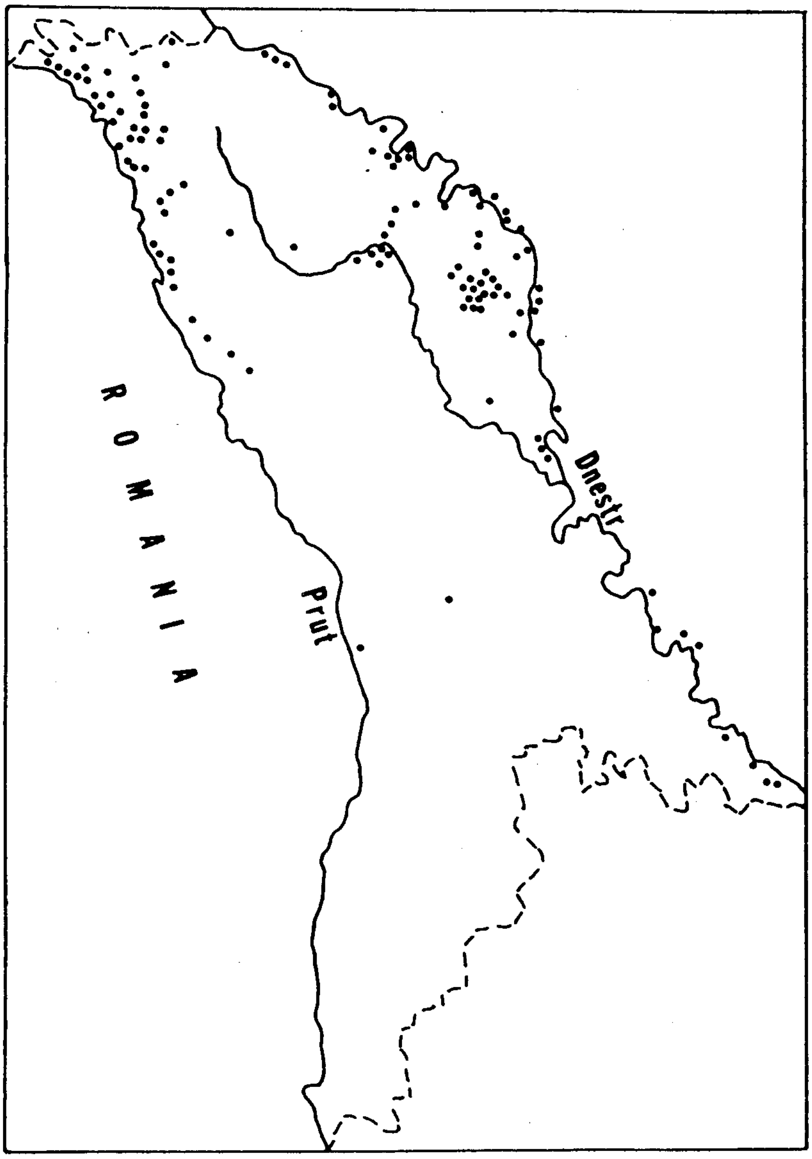
Map 18 Cucuteni B sites in E. Romania



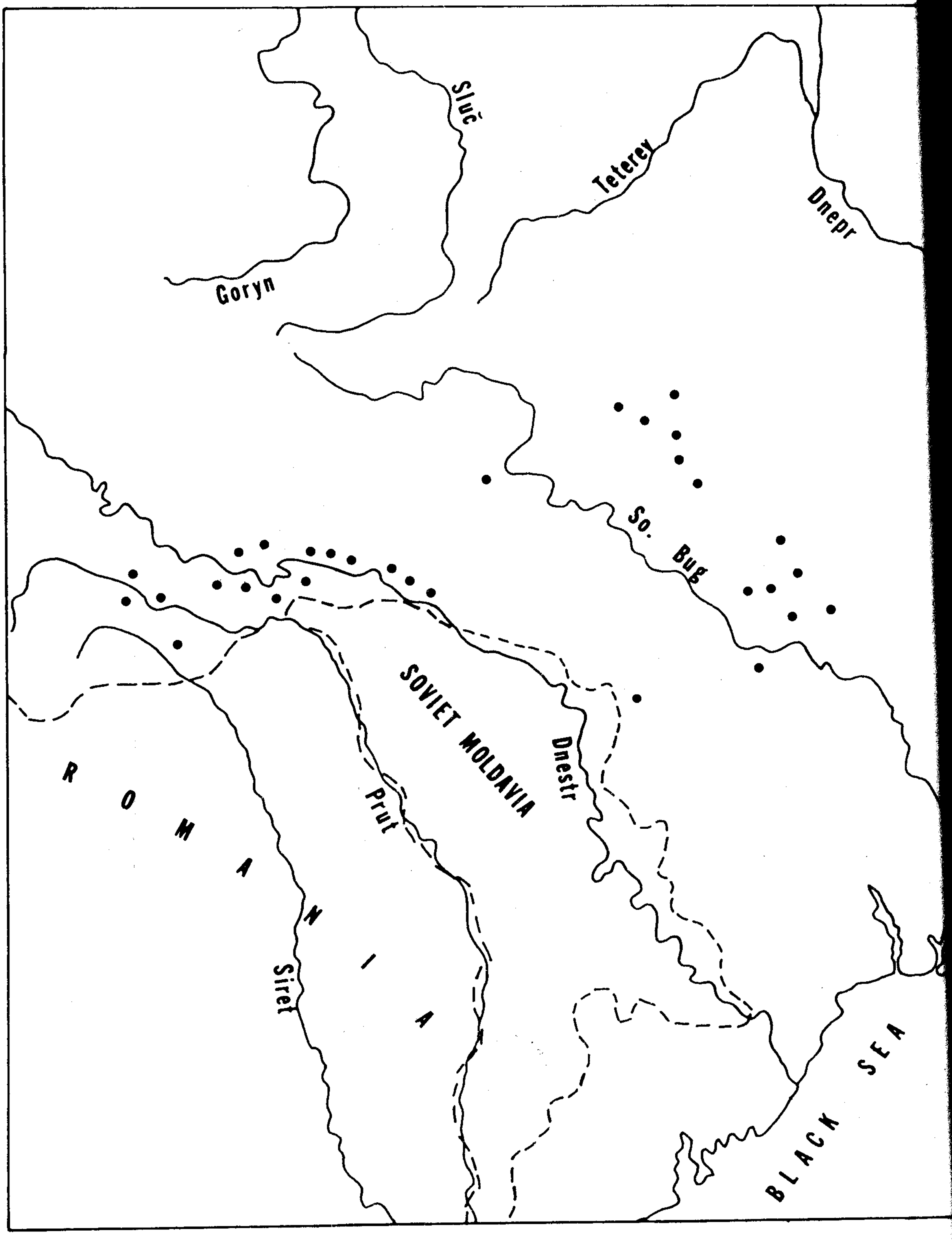
Map 19 Tripolye A sites in Soviet Moldavia



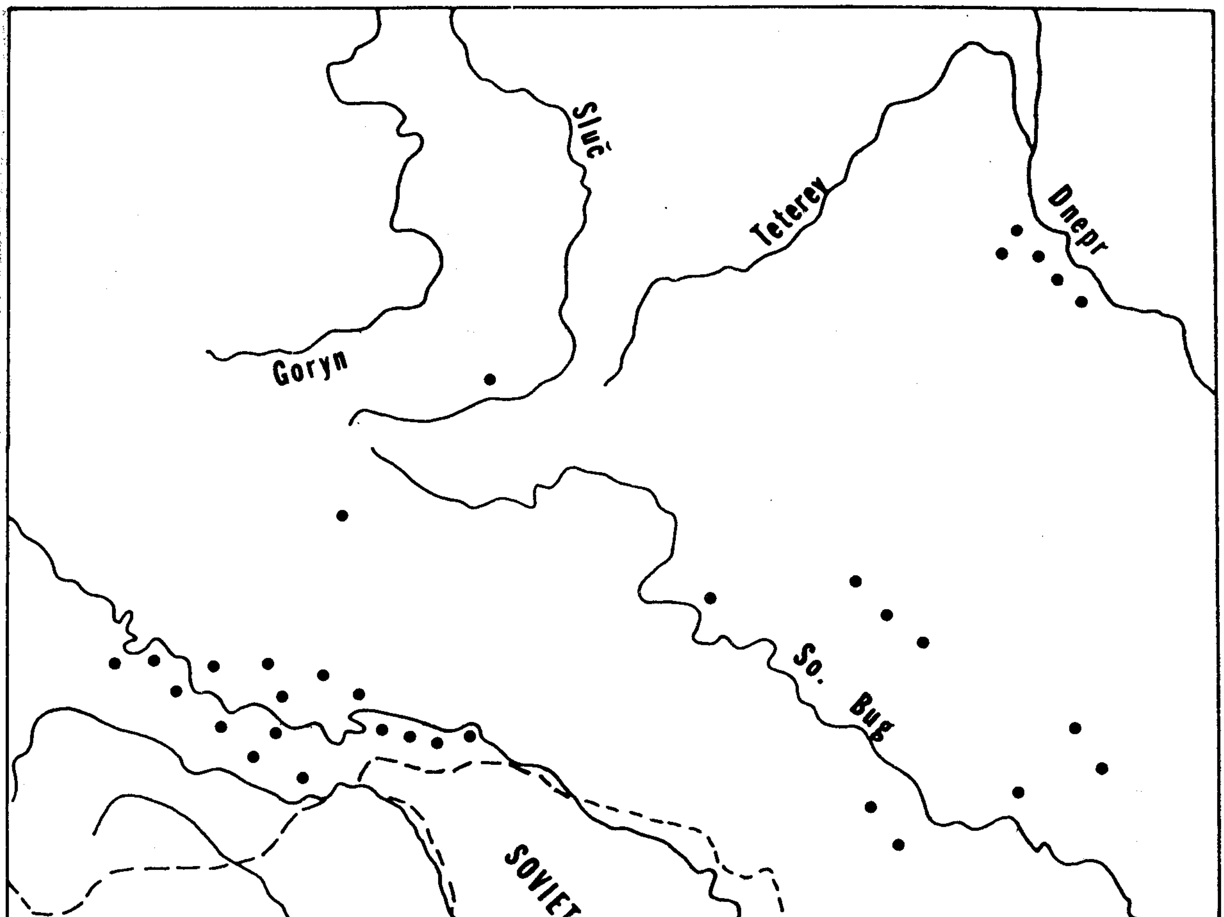
Map 20 Tripolye B sites in Soviet Moldavia



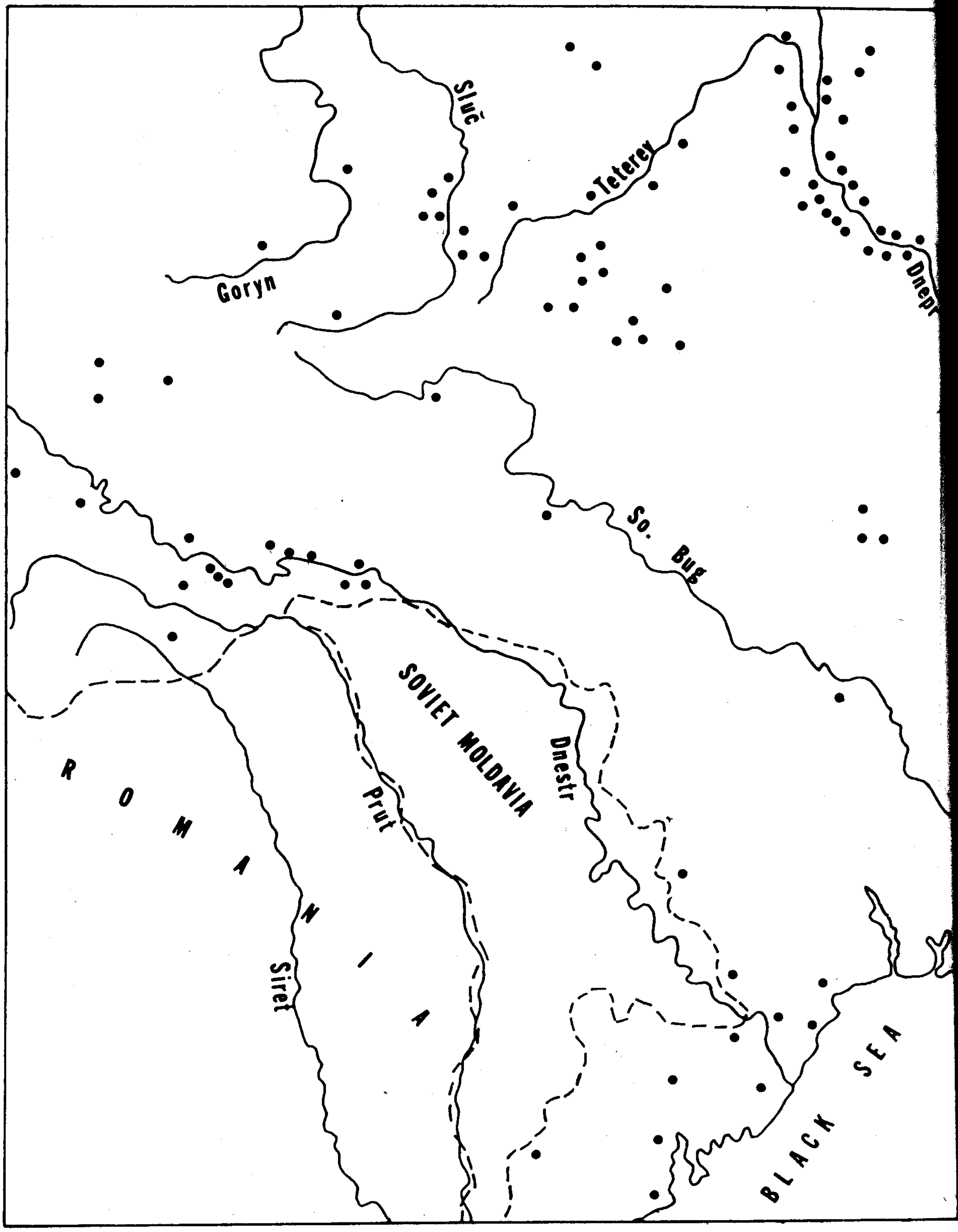
Map 21 Tripolye C sites in Soviet Moldavia



Map 22 Tripolye A sites in the Ukraine



Map 23 Tripolye B sites in the Ukraine



**Map 24 Tripolye C sites in the Ukraine**

individual wealth or status. Other burials have been found, but they occur sporadically across the Cucuteni-Tripolye territory numbering three or fewer at each locus, such that their utility in generalising on the socio-economic structure through time is limited (Comşa 1974a; Bibikov 1952; Markevič 1981).

However, information on palaeodemography and the settlement system for the Cucuteni-Tripolye culture has been accumulating during the past ten years at a very rapid rate and is proving useful in documenting development towards more complex socio-economic relations. This influx of information results from several independent efforts: the compilation of sites into gazetteers (Zaharia et al. 1970; Păunescu et al. 1976; Coman 1980; Markevič 1973; Monah et al., in press), the aerial surveying of sites in the Ukraine and Soviet Moldavia by K. Šiškin (Šiškin 1973; Štiglits 1971; Markevič 1981:18, 74, fig. 14), the geomagnetic surveying of sites in the Ukraine by V. Dudkin (Dudkin 1978; Šmaglij, et al. 1973b), and the excavations of very large sites in the Ukraine (Artemenko 1979-80; Šmaglij et al. 1973a, 1976, 1977; Šmaglij 1981; Kruts and Ryžov 1983; Movša 1983).

The gazetteers have shown the locations and numbers of sites through time and clearly depict the movements of Cucuteni-Tripolye populations into new territories as well as the tremendous diachronic increase in sites. The gazetteers produced during the 1970s are somewhat out of date, due to the influx of information; however, work is progressing well to produce an up-to-date catalogue solely for Cucuteni sites in Romania (Monah 1982; Monah et al., in press).

Such an annotated listing of sites could not be located for the Ukraine; however, as indicated in chapter I, several extremely large sites have been discovered in the Uman' region, located in the Bug-Dnepr interfluve of the Ukraine (map 25). These settlements, surveyed in the 1970s and only recently receiving limited excavations, give good indications of the magnitude of population growth and economic stability. In addition, the data on house construction show the increasing use of long houses through time and the introduction of two-storey dwellings.

### IV.B.1. Location and increase in settlements

Table 22 lists the numbers of Cucuteni-Tripolye sites from published gazetteers. As of 1970, 461 Cucuteni sites were known for eastern Romania between the Carpathians and the Prut River; of these, 33 are Pre-Cucuteni sites, 148 Cucuteni A, 23 Cucuteni AB, and 125 Cucuteni B (Zaharia et al. 1970). The current gazetteer has increased the number of known sites from 461 (1970) to over 1,200 for eastern Romania (Monah 1982; Monah et al., in press). Between the Prut and Dnestr Rivers (i.e. Soviet Moldavia), V. Markevič (1973) had identified 56 Early Tripolye (=Pre-Cucuteni III) sites, 148 for Middle Tripolye (=Cucuteni A and AB), and 109 for Late Tripolye (=Cucuteni B). Maps 15-24 show the locations of sites from the Eastern Carpathians to the Dnepr River using the 1970 (Zaharia et al.) and 1973 (Markevič) gazetteers and using data from Arheolohija Ukrains'koi RSR (1971) for the Ukraine.

Some of these loci may not have been actual settlements, since

Table 22 Numbers of Cucuteni-Tripolye sites from published gazetteers.

| Region (Romania) | Number Pre-Cucuteni | Cucuteni A | Cucuteni A-B | Cucuteni B | Cucuteni? | Total |
|---|---|---|---|---|---|---|
| Between Carpathians and Prut River, 1970 | 33 | 148 | 23 | 125 | 132 | 461 |
| Botoşani County, 1976 | 6 | 69 | 49 | 77 | 100 | 301 |
| Vaslui County, 1980 | 13 | 101 | 14 | 4 | 50 | 182 |
| (Moldavian SSR) | Tripolye A | Tripolye B | | Tripolye C | Tripolye? | Total |
| Between Prut and Dnestr Rivers, 1973 | 56 | 148 | | 109 | 23 | 336 |

these data have been compiled from numerous sources including surface surveys and test soundings as well as actual excavations. However, even if one allows for the fact that not all loci of prehistoric activity represent villages, there are indications for a considerable growth in population and movement into and exploitation of areas north, west, and south of the core Carpathian area.

### IV.B.2. Settlement size and planning

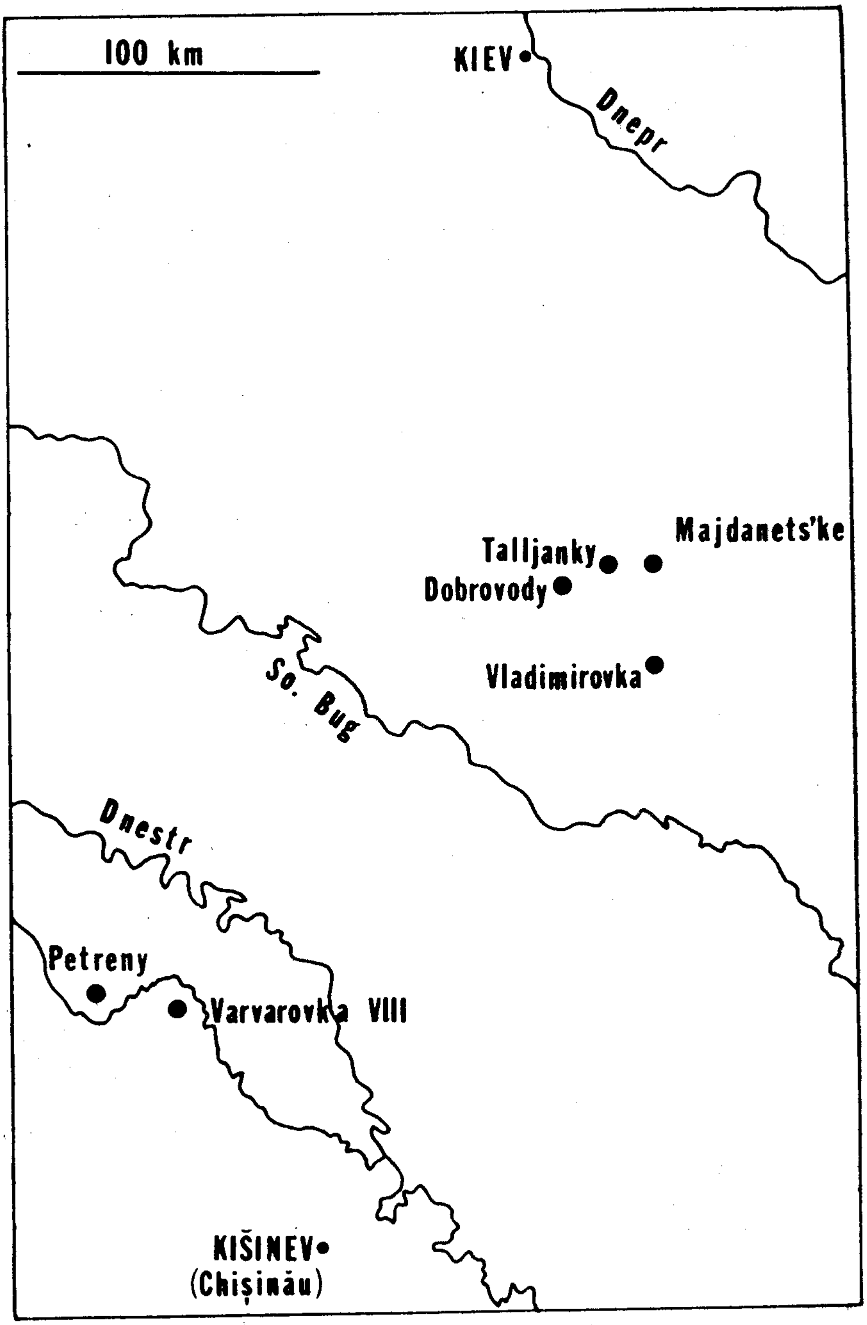
New information concerning the sizes of Cucuteni-Tripolye settlements through time gives not only more direct insight on population growth but also shows the considerable planning of these settlements and how well organised the activities of the inhabitants were. The average Cucuteni-Tripolye village throughout the painted ware sequence consisted of 20 to 50 dwellings arranged in no particular preconceived plan. However, during the Cucuteni A and AB (=Tripolye B) period appear the first signs of the development towards large, high-population centres. This densification process culminated during the Cucuteni B (=Tripolye C) period and is exemplified by the recently surveyed sites in the Uman' region of the Ukrainian SSR. The earliest site to depart from the usual Neolithic pattern of settlement formation is the completely excavated site of Truşeşti in northeastern Romania. The settlement consists of 98 dwellings--95 belonging to the Cucuteni A period--which are not arranged in any specific plan (Petrescu-Dimboviţa 1963). Vladimirovka, dating to Tripolye B II, is the oldest of this group of sites to show some limited settlement planning in the form of houses arranged in semicircular fashion (Passek 1949). However, with the inception of the Late Tripolye period, circular or ellipsoidal arrangement of several hundred to possibly as many as 2000 buildings can be observed (figs. 67-69).

Two of these large sites, Varvarovka VIII and Petreny (Petreni), are located in the Prut-Dnestr interfluve. Only five of the 200 structures at Varvarovka VIII have been excavated, one of which (no. 3) is actually a pottery workshop (section III.D.) (Markevič 1981). And only eight of the 498 structures at Petreny were excavated at the turn of the century (von Stern 1907). However, recent aerial surveying by K. Šiškin has revealed the arrangement of structures at Petreny into ten tightly concentric rings with intervening pathways (Markevič 1981:18, 74, fig. 14). The site is located in intensely hilly terrain on a high plateau of considerable proportions, which slopes downwards to the north, east and west, but descends abruptly on the south side to a stream below. Ditches or their accompanying ramparts are absent. The house platforms are of standard dimensions measuring approximately 8 x 5 m; on the outskirts of the settlement is a row of larger buildings measuring 14-16 x 6-7 m. The buildings appear to be equidistant and arranged in circles with some buildings off by themselves at a distance of 120-150 m from the settlement. In the centre remained a free, oval platform approximately 50 m in diameter, and two large buildings were detected close to the centre. The total number of buildings includes 446 small, 9 medium, 35 large and 8 previously excavated by von Stern, totalling 498. V. Markevič (1981) calculates a population of about 4000, assuming that the average number of inhabitants for a small house was 7, medium house 10, and a large house 15 (vide infra).

Table 23 Largest Cucuteni-Tripolye settlements.

| Site | Period | No. of Buildings | Area (ha) | Reference(s) |
|---|---|---|---|---|
| Truşeşti | Cucuteni A | 95 | 4 | Petrescu-Dimboviţa 1963 |
| Vladimirovka | Middle Tripolye | 200 | 76 | Passek 1949 |
| Petreny | Middle-Late Tripolye | 498* | 30 | von Stern 1907; Markevič 1981 |
| Varvarovka VIII | Late Tripolye | 200 | 40 | Markevič 1981 |
| Starye Badrazi | Late Tripolye | ** | 50 | Markevič 1981 |
| Suškivka | Late Tripolye | ** | 27 | Šiškin 1973 |
| Krasnostavka | Late Tripolye | ** | 30 | Šiškin 1973 |
| Čyčyrkozivka | Late Tripolye | ** | 50 | Šiškin 1973 |
| P'janižkove | Late Tripolye | ** | 60 | Šiškin 1973 |
| Kosenivka | Late Tripolye | ** | 70 | Šiškin 1973 |
| Dobrovody | Late Tripolye | * | 250 | Šiškin 1973; Movša 1983 |
| Nebelivka | Late Tripolye | ** | 250 | Šiškin 1973 |
| Majdanets'ke | Late Tripolye | 1200-1700* | 270 | Dudkin 1978; Šiškin 1973; Šmaglij et al. 1973a, 1973b, 1976, 1977, 1981; Artemenko 1979-80 |
| Glybočok | Late Tripolye | ** | 300 | Štiglits 1971 |
| Talljanky | Late Tripolye | * | 400 | Šiškin 1973; Kruts and Ryžov 1983 |

* figs.
** area only determined by aerial surveying; details are lacking



Map 25 High-population Tripolye settlements with excavations in Soviet Moldavia and the Ukraine

In the Ukraine, a large number of these densely populated Late Tripolye sites have been found and surveyed (table 23, map 25). Judging by the occupation areas, these sites appear to cluster into two groups: 25-75 ha and 250-400 ha. Unfortunately, no specific details are available for the former group; however, for the latter group, three sites have received attention and limited excavation has begun. The site of Majdanets'ke is located on a projection of a plateau rising over a river valley and covers an area of approximately 270 ha. On the area that has received magnetometer surveys about 400 structures have been found already. The whole settlement is estimated to have consisted of anywhere from 1200 to 1700 buildings arranged in 10 to 12 concentric ellipses. The buildings were rectangular in plan. As at Petreny, there was a row of very large building foundations at the outskirts of the settlement (Artemenko 1979-80; Dudkin 1978; Šiškin 1973; Šmaglij et al. 1973a, 1973b, 1976, 1977, 1981).

The site of Dobrovody covers 250 ha and is located by a river. As of 1981, 220 small rectangular buildings had been identified from surface surveys conducted after harvesting. Only two dwellings have been excavated so far. From aerial and surface surveys, the buildings had been organised into several concentric rings, and interconnecting pathways could also be determined (Šiškin 1973; Movša 1983).

The largest known site is Talljanky, covering 400 ha, and was also situated on a plateau. Figure 72 shows the aerial survey of the site as known in 1973. The settlement is oval in plan and measures 3.5 x 1.5 km As of 1981, a surface survey of one small area of the site revealed 438 buildings arranged in several rows along the slope of the plateau, but only one rectangular building (10 x 4 m) has been excavated (Šiškin 1973; Kruts and Ryžov 1983).

Population estimates for sites such as Petreny are highly speculative and are based on the assumptions that all of the buildings were residential in nature and occupied at about the same time. Concerning the first assumption, pending actual excavation many of the smaller buildings may well prove to be food storage buildings built next to and associated with dwellings. This hypothesis is not unreasonable when one considers the site of Kolomijščina where a small food storage building was found next to a longhouse (section IV.C.1.) and the large quantities of storage vessels (up to 50) that are found in some dwellings and which would decrease available living space. Even larger buildings may not prove to be residences: Of the eight buildings (out of 498) excavated at Petreny, all eight were non-residential and assumed by this author to be pottery workshops; of the five buildings (out of 200) excavated at Varvarovka VIII, one was also a pottery workshop. The foregoing data merely underlines the need for thorough excavation before we can assume a building to be a residence and subsequently extrapolate population figures.

Concerning the second assumption above that most, if not all, buildings were used at about the same time--aerial surveying, followed by more precise magnetometer surveying, has revealed definite patterns of building arrangement and intervening pathways so much so that one can observe preconceived settlement planning in concentric rings or even planning of districts (fig. 71).

Even if one takes the most conservative view towards population estimates and assumes that half of the buildings were used for purposes other than residential, then one could at most decrease Markevic's population estimate of 4000 for Petreny to 2000. This population size stands in stark contrast to what is normally thought of in terms of Neolithic village populations. Clearly, a break from the Neolithic tradition and a crucial element of ranked society, i.e. higher population aggregates, can be observed here. It is important to keep in mind the growing number of such large sites which have been discovered (table 23). Although it is imperative that only excavation will reveal the exact nature of these building agglomerations--and excavation has already begun--the number of these sites is too large to be ignored in assessing the growing complexity of socio-economic relations.

## IV.B.3. Sizes of dwellings

Concomitant with the increase in the number and sizes of settlements is a growing predilection towards the construction of long houses and even two-storey houses.

The tradition of the one-family dwelling gradually gave way, during the later phases and as one progresses towards the east, to larger buildings. This trend is clearly seen by such Late Tripolye sites as Kolomijščina I in the Dnepr River region whose dwellings reach up to 23 m in length, may contain as many as five ovens, and are subdivided into several rooms (Passek 1949:134-135). These large dwellings prompt one to suspect that if these buildings were not being used by more than one family they might at least house kin of the extended family. Although, it should not be construed that all buildings at any particular settlement would have similar dimensions: Building size varied considerably and appears to have been dictated by function and/or need. Using data from Passek (1949:134 ff), building sizes could be grouped as follows:

1) small: 4-8 m (l) x 2-5 m (w); 10-15 ceramic vessels
2) medium: 10-15 m (l) x 5-6 m (w); 20-30 ceramic vessels
3) large: 16-23 m (l) x 6-8 m (w); 35-50 ceramic vessels

The construction details of two-storey buildings were outlined in chapter II. However, their occurrence, location within the site, and function varied considerably. For instance on smaller sites (i.e. under 200 buildings) only one or two of these two-storey buildings may occur and in no specific location. Whereas, on larger sites such as Petreny and possibly also at Majdanets'ke, a row of large two-storey buildings was found at the outskirts of the settlements. Function also varies: As was discussed in chapter III, the two-storey structures found at Varvarovka VIII and Petreny were determined to be ceramic workshops and not residences. However, at other sites such as Brynzeny III (Brânzeni), the occupation debris recovered from two-storey buildings does suggest that they were used as dwellings (Markevič 1981).

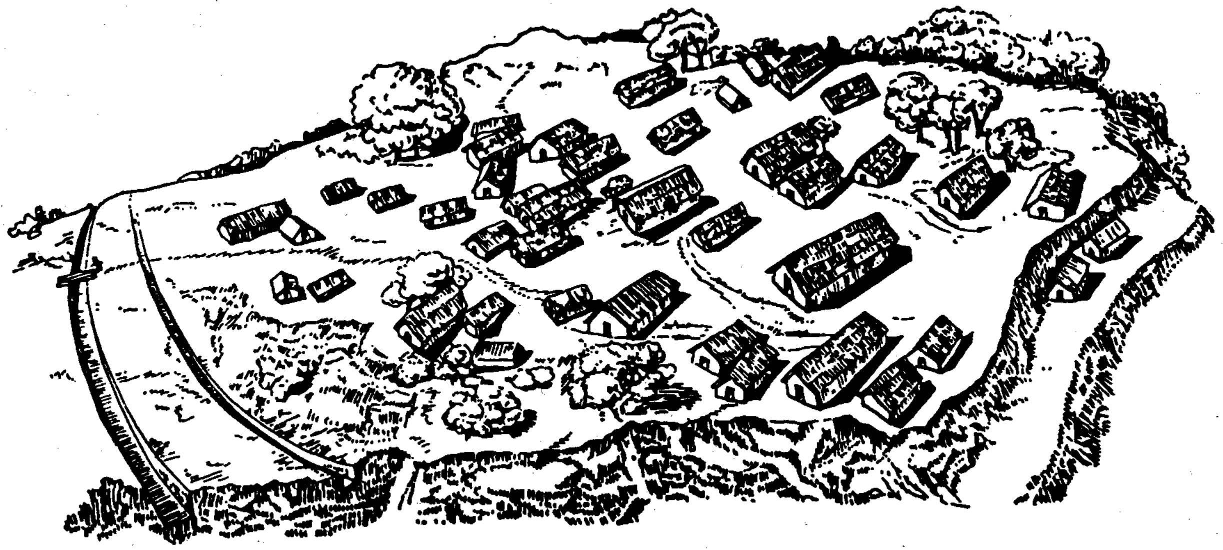


Fig. 67 Reconstruction of the typical Cucuteni-Tripolye village of Hăbăşeşti.

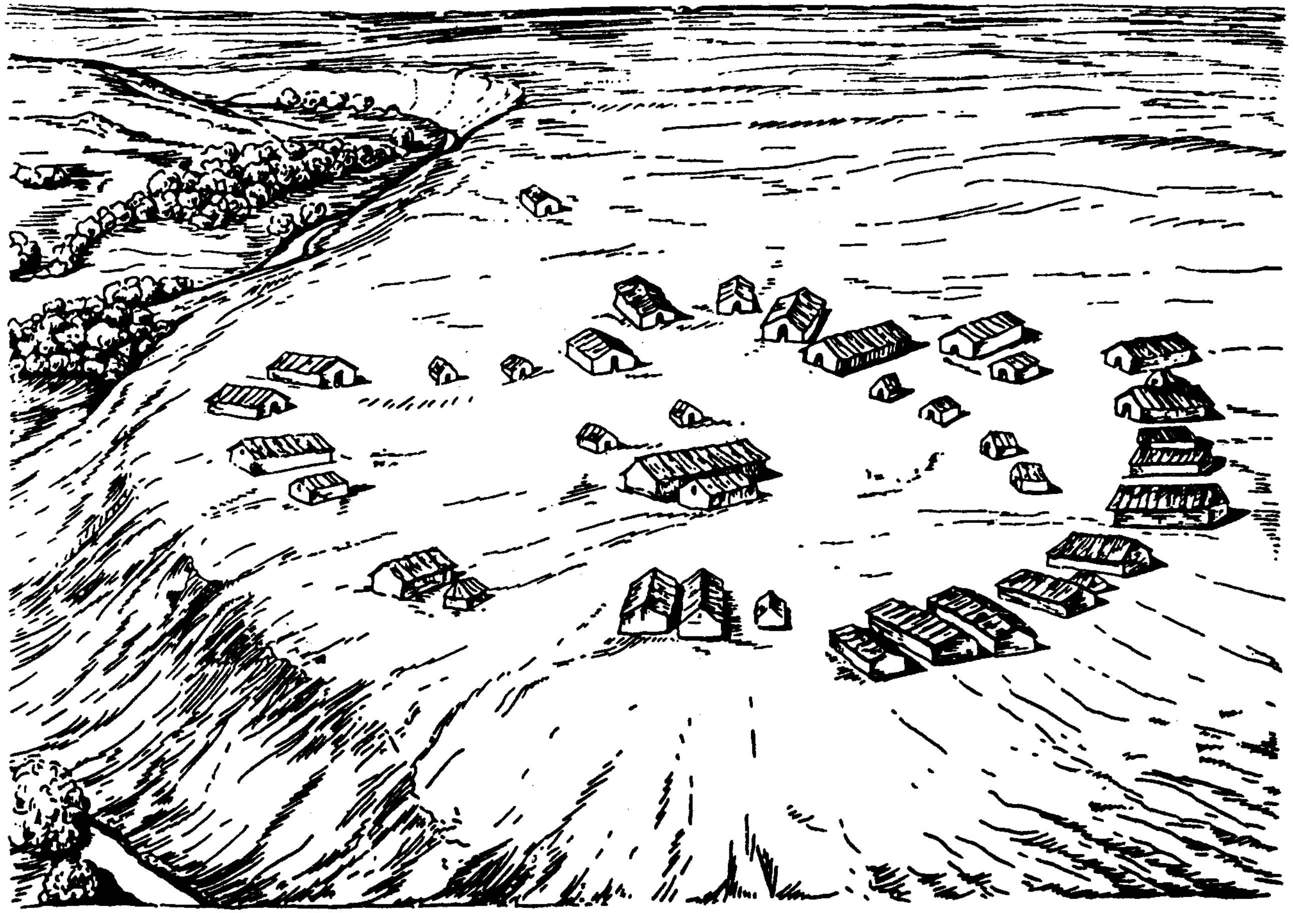


Fig. 68 Reconstruction of Kolomijščina I, showing an early form of circular settlement planning.

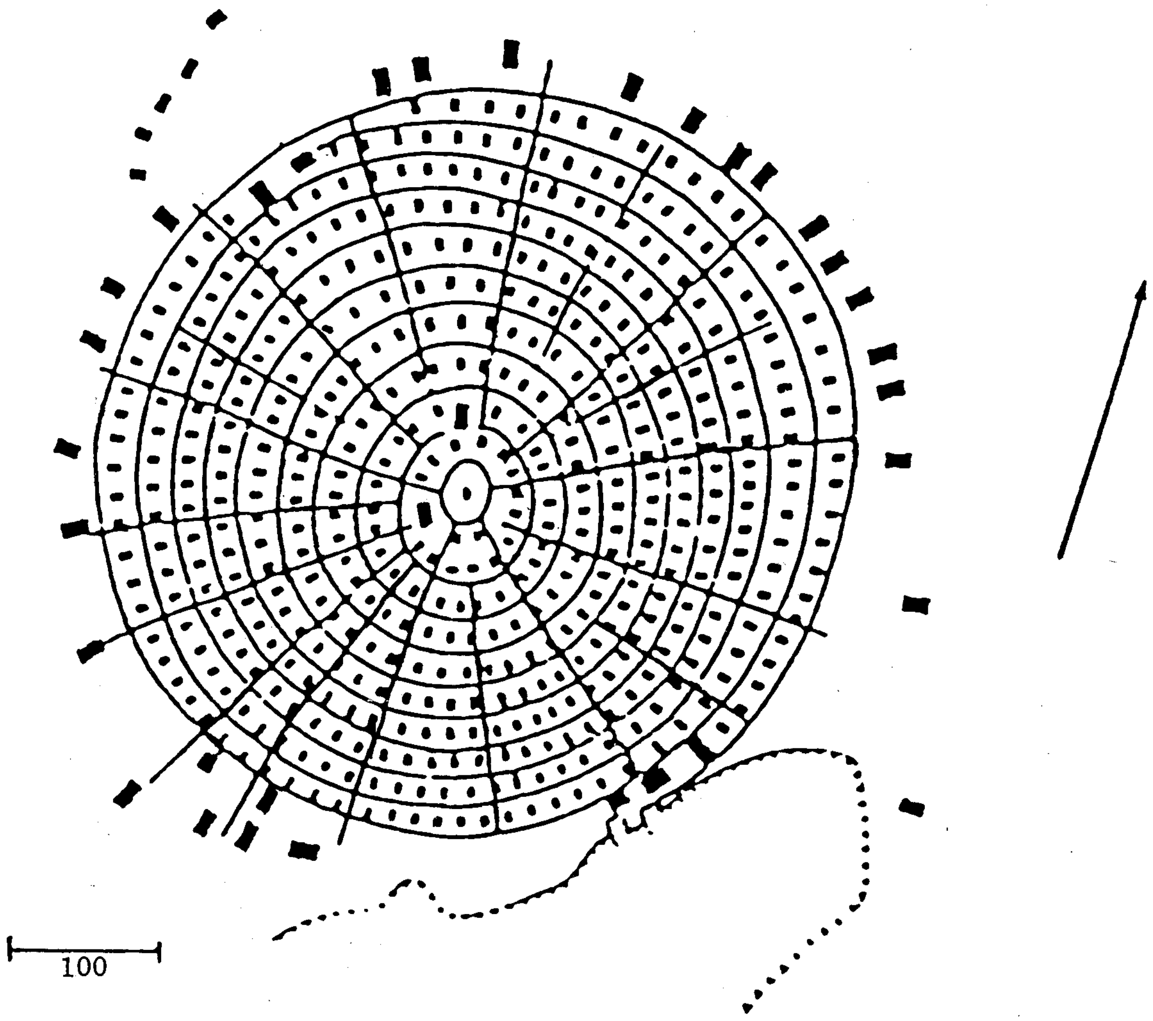


Fig. 69 Aerial photographic survey of Petreny (Petreni).

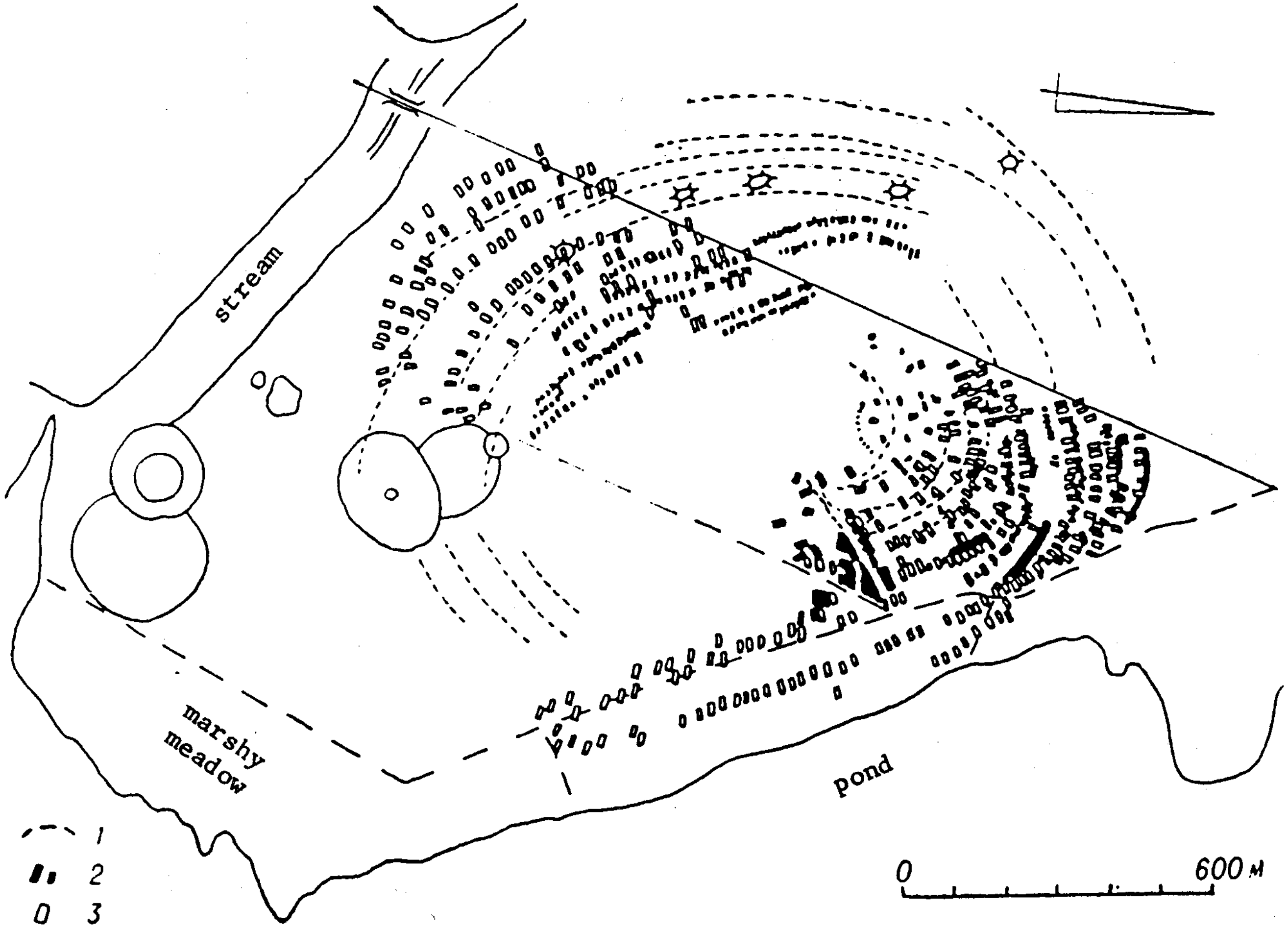


Fig. 70 Survey results for Majdanets'ke (1 - concentric circular plan of buildings, 2 - house platforms detected by aerial survey, 3 - house platforms detected by surface surveys).

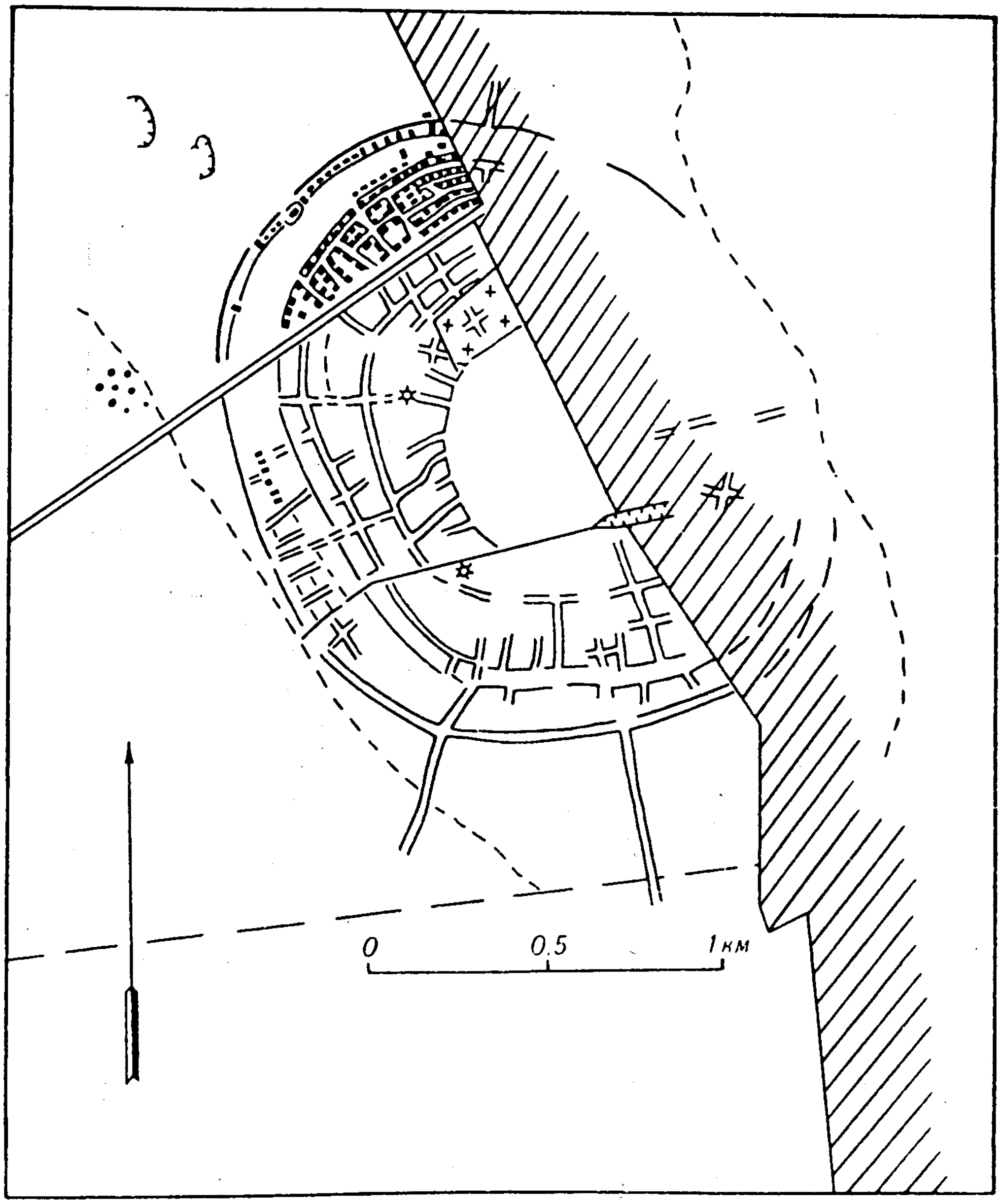


Fig. 71 Aerial survey map of Dobrovody; northern part of site surveyed by magnetometer.

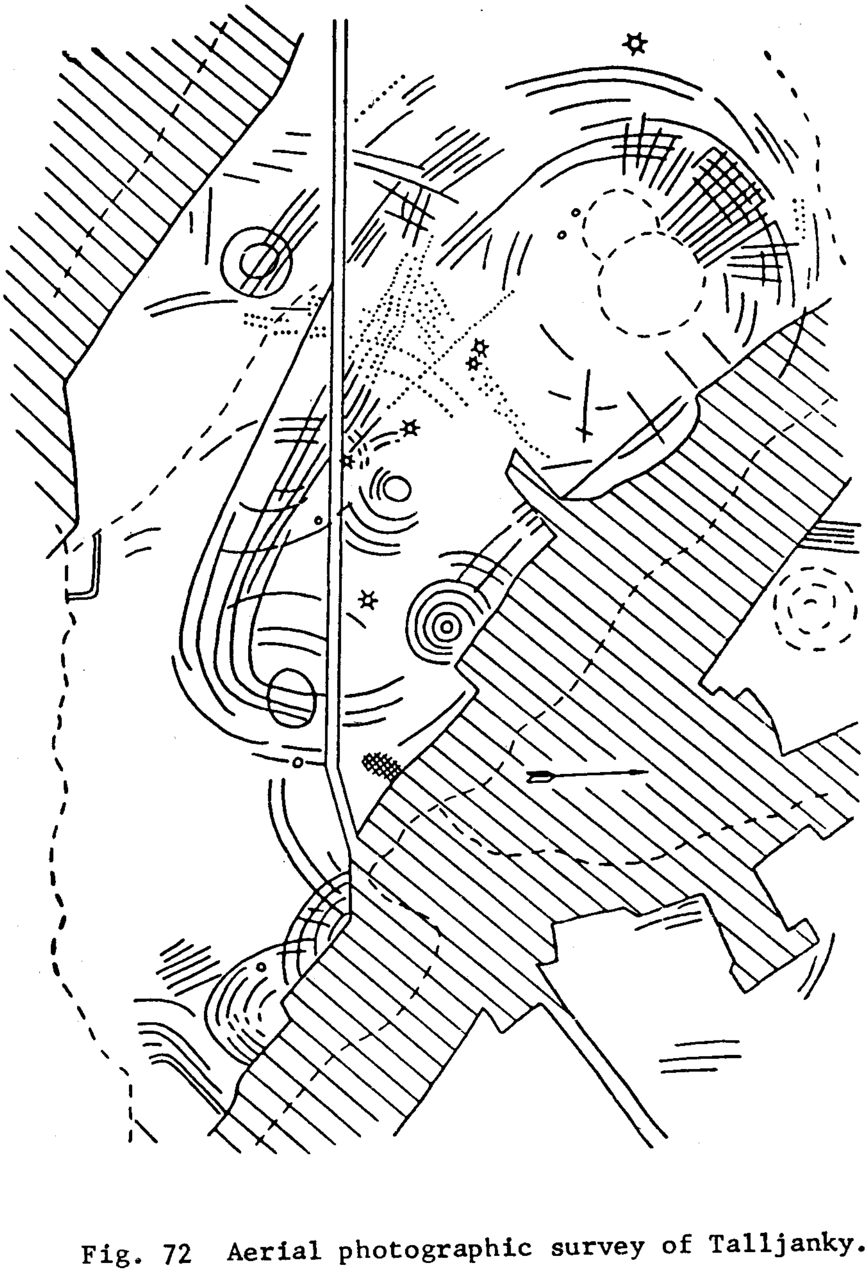
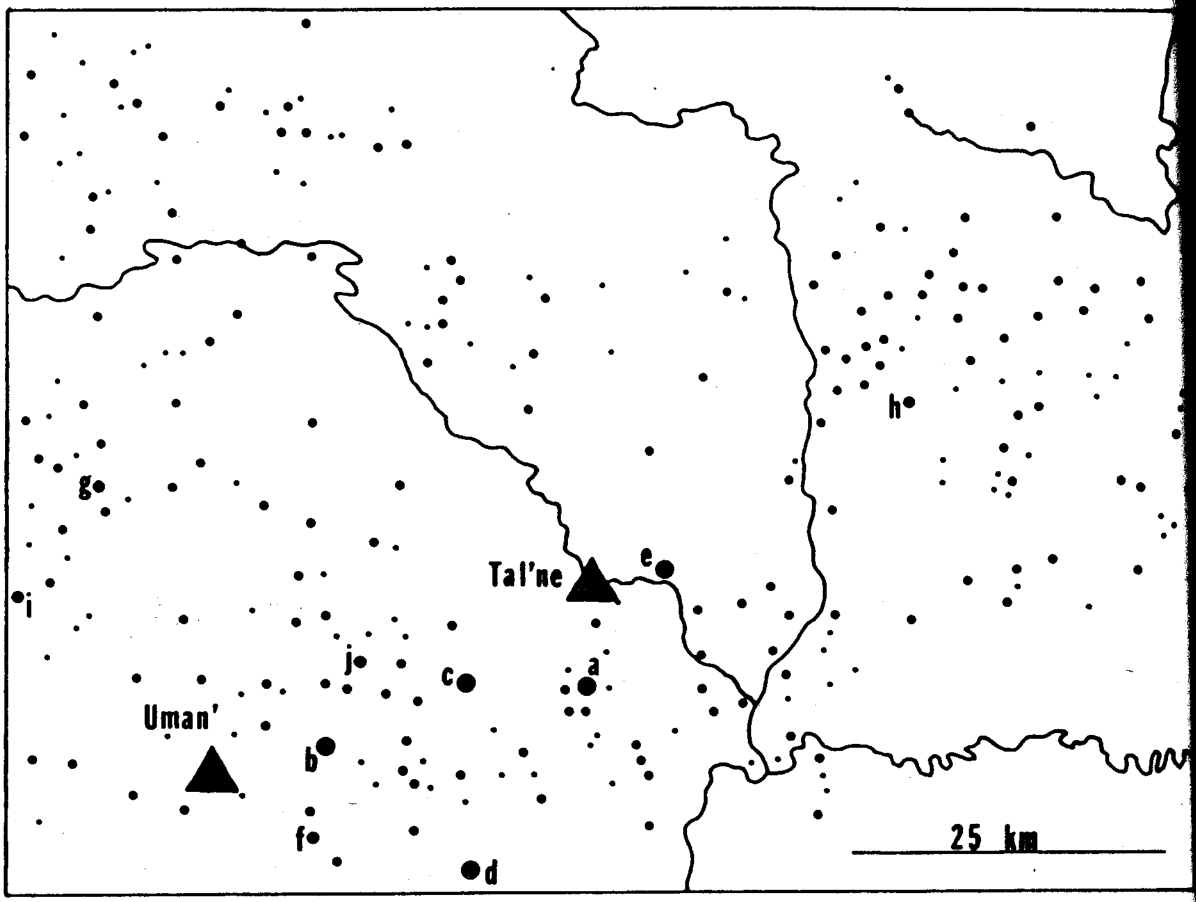


Fig. 72 Aerial photographic survey of Talljanky.

Map 26 Tripolye settlements in the Uman' region (Ukraine)



- ● settlements 250-400 ha
- • settlements 25-75 ha
- • other, well documented settlements
- · other, poorly documented settlements

| | | | |
|---|---|---|---|
| a | Majdanets'ke | f | Suškivka |
| b | Dobrovody | g | Krasnostavka |
| c | Talljanky | h | Čyčyrkozivka |
| d | Nebelivka | i | P'janižkove |
| e | Glybočok | j | Kosenivka |

5. increase in the size of individual residence groups
6. greater productivity
7. clearly defined territorial boundaries
8. a more integrated society with a greater number of social statuses
9. centres which co-ordinate social, religious, and economic activity
10. frequent ceremonies and rituals serving wide social purposes
11. rise of religious specialists
12. specialisations, not only regional or ecological but also through the pooling of individual skills in large co-operative endeavours
13. organisation of public labour for agricultural or construction work
14. improvement in craft specialisation
15. potential for territorial expansion
16. reduction of internal strife
17. inequality of persons or groups as a result of permanent political leadership
18. distinctive dress or ornament for those of high status
19. no true government to backup decisions by legalised force

It is important to note again that the above criteria are merely guidelines: Renfrew (1974) maintains that, under favourable circumstances, all of the above characteristics should be identifiable in the archaeological record. However, since archaeological circumstances are not always favourable, and this is the case with the Cucuteni-Tripolye culture, some of these criteria may not be readily visible and some may be derived indirectly on the basis of other archaeological data (vide infra).

Turning to the Cucuteni-Tripolye culture in the late period as an example, the most readily recognisable criteria for the existence of ranked society are as follows: Greater population density, increase in total population, and an increase in the size of individual residence groups (on the basis of increased dwelling size) have already been described well in this chapter as clear hallmarks of fundamental demographic and social changes. More clearly defined territorial boundaries can be identified from the increasing use of as many as three ditch/rampart constructions which surround almost all settlement (cf. section II.C.6) and secondly, the equal distances at which the very large sites of the Uman' region are located also indicate boundaries (vide supra). The potential for territorial expansion was almost limitless for the Cucuteni-Tripolye culture as its populations moved over the Eastern Carpathians and across Moldova into the Ukraine with no apparent impediments. Sites such as Petreny, Varvarovka VIII, Majdanets'ke, Dobrovody, Talljanky, and many others may prove to be centres which co-ordinated social, religious, and economic activities--pending not only their excavation but also study of the surrounding sites.

Most of the other criteria can only be based on very limited data--at the present time--or must be derived logically from circumstantial evidence. For instance, the existence of settlements with probably as many as 2000 dwellings, based on many hundreds of constructions which have already been found at each of the largest sites--together with the fact that these settlements show varying degrees of preconceived planning, indicating reasonable contemporaneity of dwelling occupation--leads one to calculate tremendous population aggregates. Biologically speaking, it is only logical that greater productivity in food procurement activities is absolutely essential. It also follows that the redistribution of produce, skill specialisation, and the organisation of public labour for agricultural and construction work--which could only have been organised within a ranked society--would be required for the survival of these large, pre-Bronze Age population centres. In addition, the increased densification and longevity of settlements like Petreny would necessitate the reduction of internal strife without the need of force to maintain stability.

The proof of criteria 8, 17, and 18--all relating to individual status within the social group--will necessarily have to await the discovery and analysis of more burials.

Criteria 10 and 11 both refer to the spiritual or magico-religious life of the inhabitants. Actual archaeological proof of religious personages does not exist and may never be found except in a burial context. However, evidence for ceremonial/ritual behaviour abounds on Cucuteni-Tripolye sites (cf. Gimbutas 1982). Stylised female and zoomorphic figurines are found on every excavated Cucuteni-Tripolye settlement, inside and outside dwellings. The most dramatic example is the discovery at Tell Poduri of 21 painted and unpainted female figurines with accompanying seats ("thrones") all contained inside a Pre-Cucuteni vase (Monah et al. 1983). In addition to female sculptures are also found what appear to be models of sanctuaries (e.g. Truşeşti) and the omnipresent twin vases ("binocular vases") which could not have served any utilitarian purposes, since they are both hollow and bottomless (cf. Petrescu-Dîmboviţa 1963; Gimbutas 1982; Kandyba 1937).

Finally, improvements in pyrotechnology and in the organisation of manufacturing clearly contributed to the overall development of complex society (cf. chapter III). Very early in the painted ware sequence at the site of Ariuşd, the discovery of more than a dozen kilns attest to the emergence of pottery production centres and this trend continued until the latest phase of the Cucuteni-Tripolye culture with the appearance of craft workshops and even craft production areas at the outskirts of large sites.

Using E. Service's criteria one can identify the development of an early form of ranked society among the Cucuteni-Tripolye populations. Admittedly, some types of important data are lacking such as burials and the thorough excavation of the large sites of the Uman' region. However, it is felt that enough data do exist to define an embryonic form of complex socio-economic organisation in at least three areas--northeastern Romania, central Soviet Moldavia, and the Uman' region of the Ukraine--during the latter half of the Cucuteni-Tripolye sequence.

## IV.C. Pyrotechnology and its role in socio-economic evolution

The remainder of this chapter will be devoted to the interrelationships of technological and socio-economic evolution. The effect of intense ceramic technology on socio-economic development can be seen in at least three areas: the removal of a significant portion of the population from agricultural production, the high degree of organisation of manufacturing activities, and the use as a means of storage to which the finished product was put. This situation was not one-sided: Social and economic needs also waged their influence on ceramic technology. The population densification process would necessarily require protection against the possibilities of a dwindling food supply. Therefore, the demand for well fired storage vessels necessitated mass production methods.

### IV.C.1. Feeding the masses: technology and food storage

As was noted in chapter III, no significant changes in paste preparation and vessel firing could be detected during the painted ware sequence--from the beginning of Cucuteni A (=Tripolye B I), potters had manufactured dense, well oxidised, well fired products. Much verbal debate has issued concerning the use of this fine painted pottery. Fire and soot marks from cooking are seldom observed, many times vessels are found in a ritual context, and there is an unusually high retrieval rate of whole, undamaged vessels when compared to the finds from contemporaneous cultures. These facts together with the appearance of the shell/sand-tempered "Type C" ware have induced some researchers to believe that the painted vessels were not used for culinary purposes at all. However, no simplistic explanation on use will suffice. It appears that use, as may be defined from archaeological context, varied in both time and place. One cannot simply say that "Type C" ware was used for cooking in the entire Cucuteni-Tripolye culture (cf. Passek 1949). As mentioned in chapter II, this intrusive ware is quite rare (i.e. less than a dozen sherds), and even non-existent, at many sites in the Carpathian region. The kitchen use of "Type C" ware may very well hold true for the more easterly regions and for the latest period of the Cucuteni-Tripolye culture where this ware may comprise as much as 50% or more of the total ceramic inventory. Moreover, we must not neglect the fact that east of the Siret River, the archaic incised/excised ware persists in the technological repertoire and could very well have had culinary purposes.

However, returning to the subject of the painted ware--which was either the sole or predominant ceramic type at Cucuteni-Tripolye sites--several criteria point to the increasing use of the painted ware as a medium for food storage. First of all, vessel shape and size, which was quite varied during the Cucuteni A (=Tripolye B I) period (figs. 7 and 8), became more uniform including a predilection towards larger vessels during the Cucuteni B (=Tripolye C) period (figs. 73-76). In addition, the orifices of biconical vessels were made more restricted and the accompanying use of ceramic lids or covers was quite popular (fig. 10:76-103). It is not uncommon to encounter in Romanian museum collections whole vessels measuring up to 1 m in height and with sufficient density and weight as to require the assistance of two persons to move them. The restricted assess, considerable weight, and

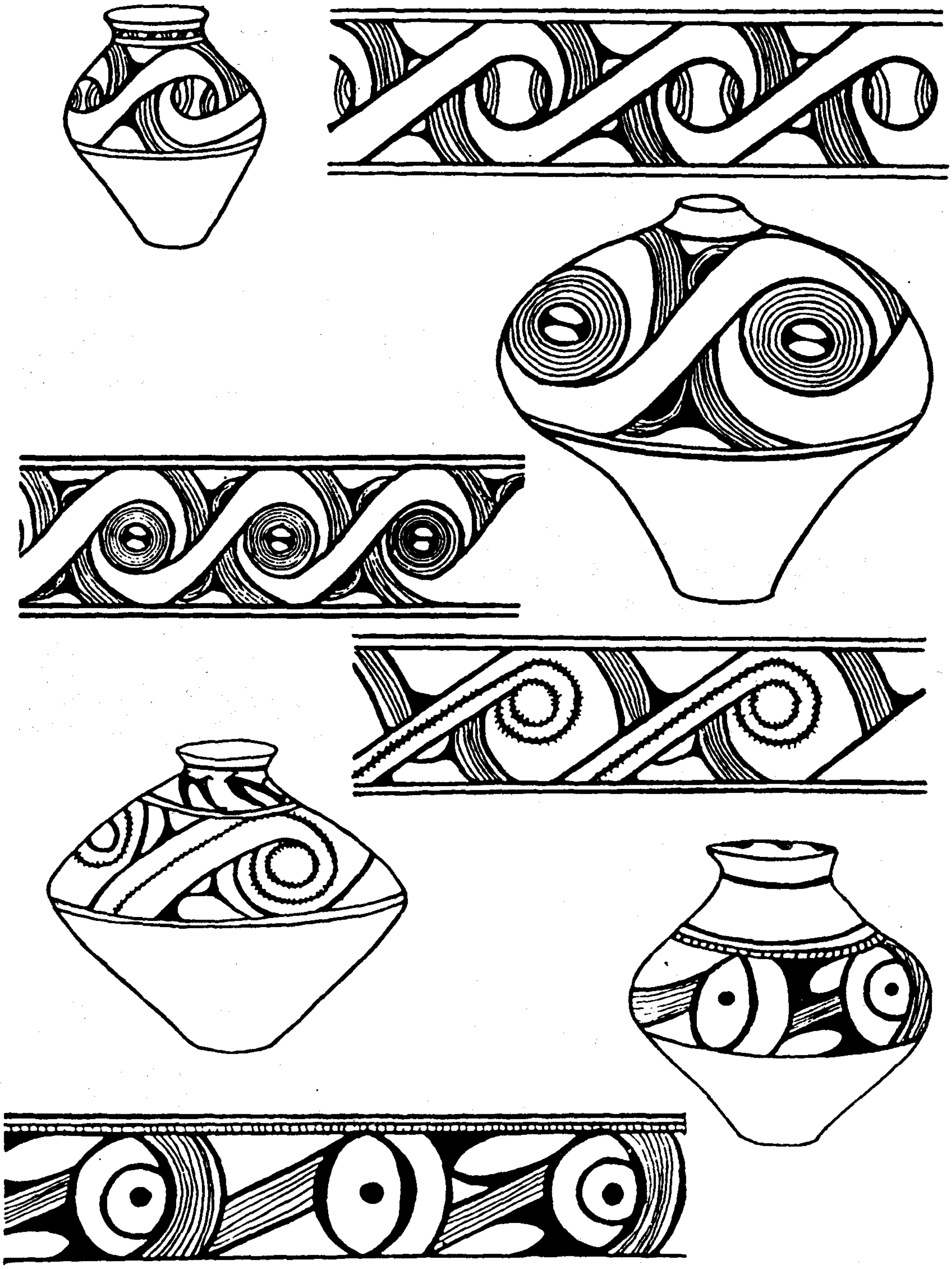


Fig. 73  Storage vessels from Petreny (1/10 natural size).

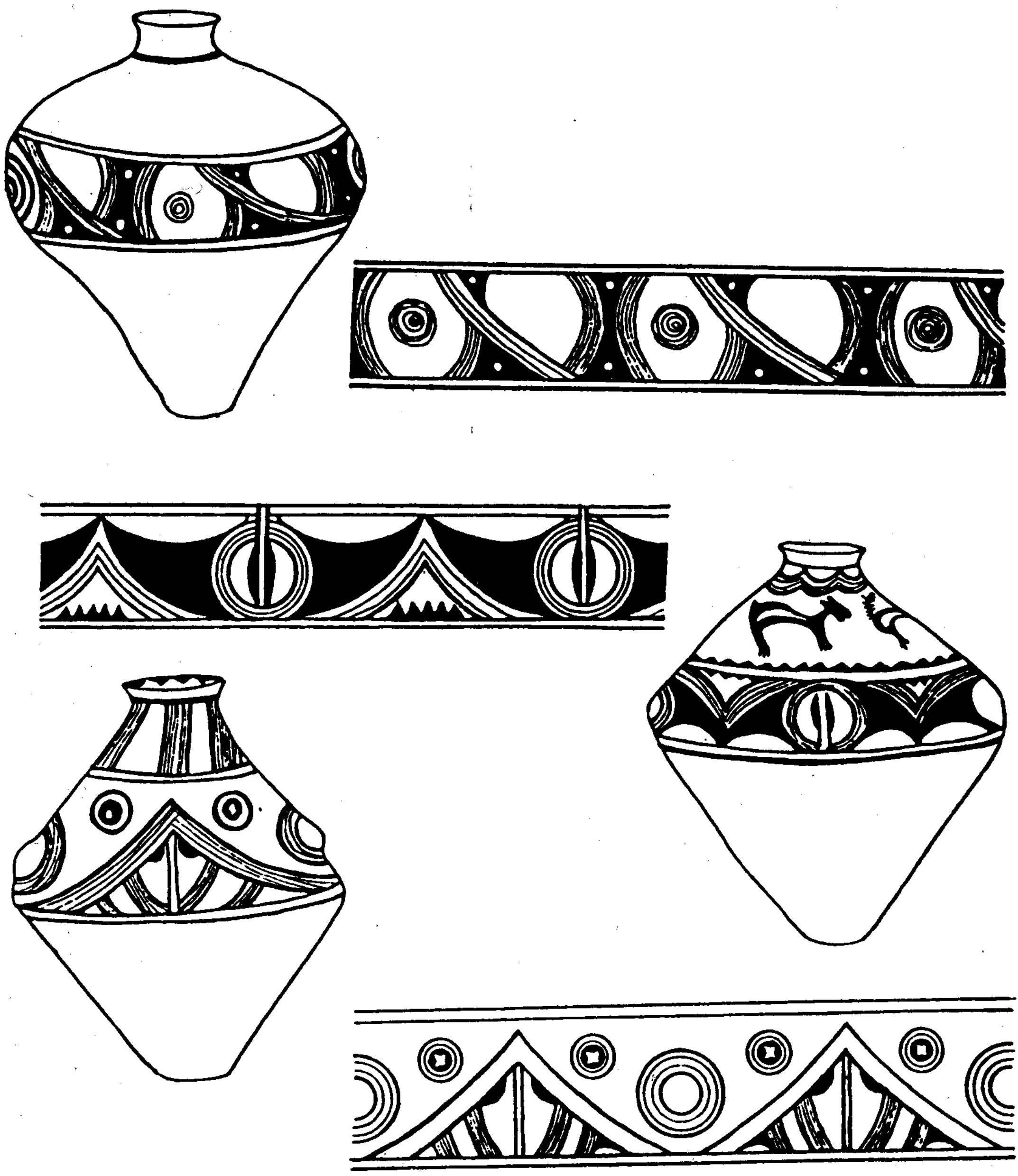


Fig. 74 Storage vessels from Krutoborodintsy II (1/10 natural size).

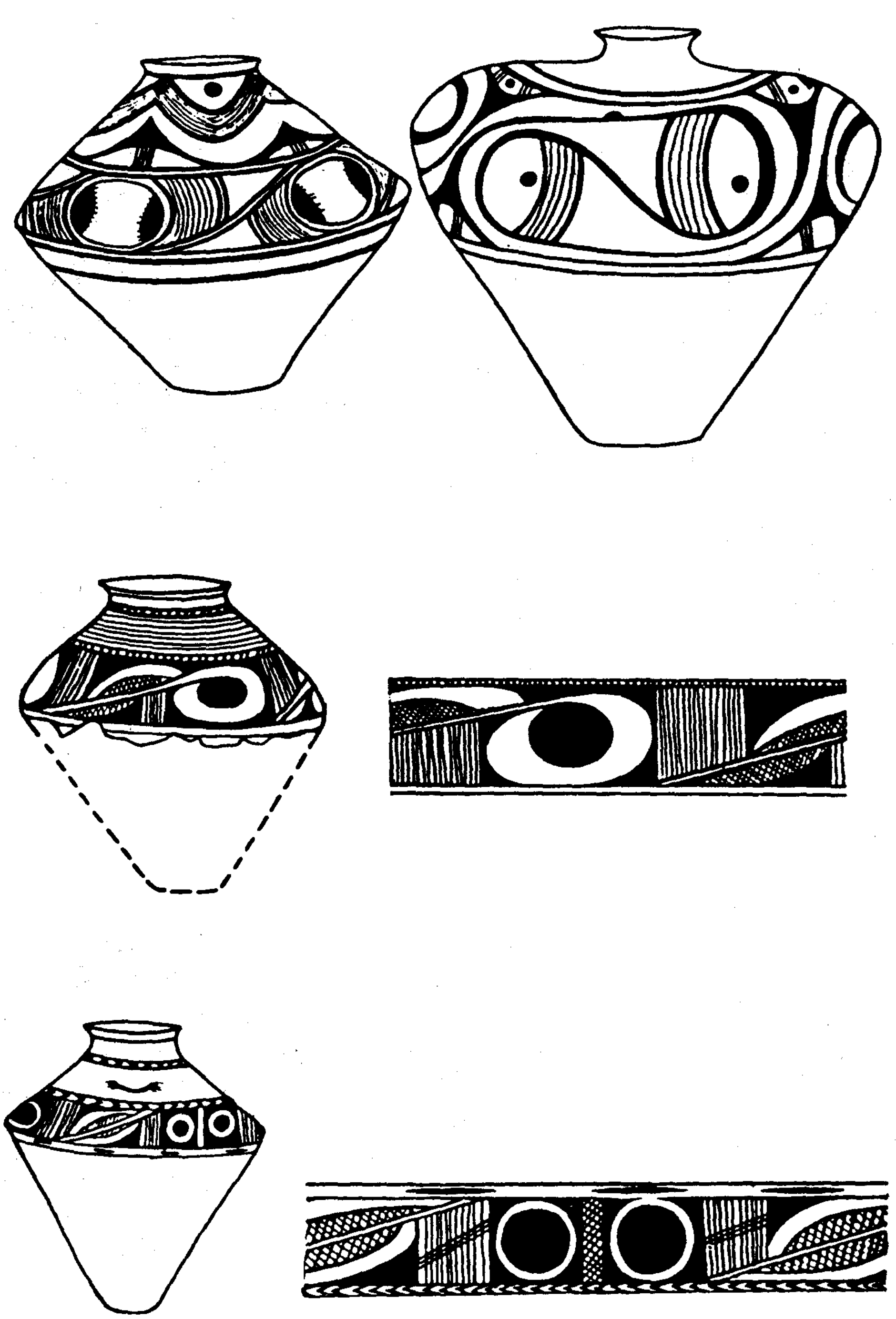


Fig. 75 Storage vessels from Staraja Buda (top; 1/6 natural size) and Tomaševka (middle and bottom; 1/20 natural size).

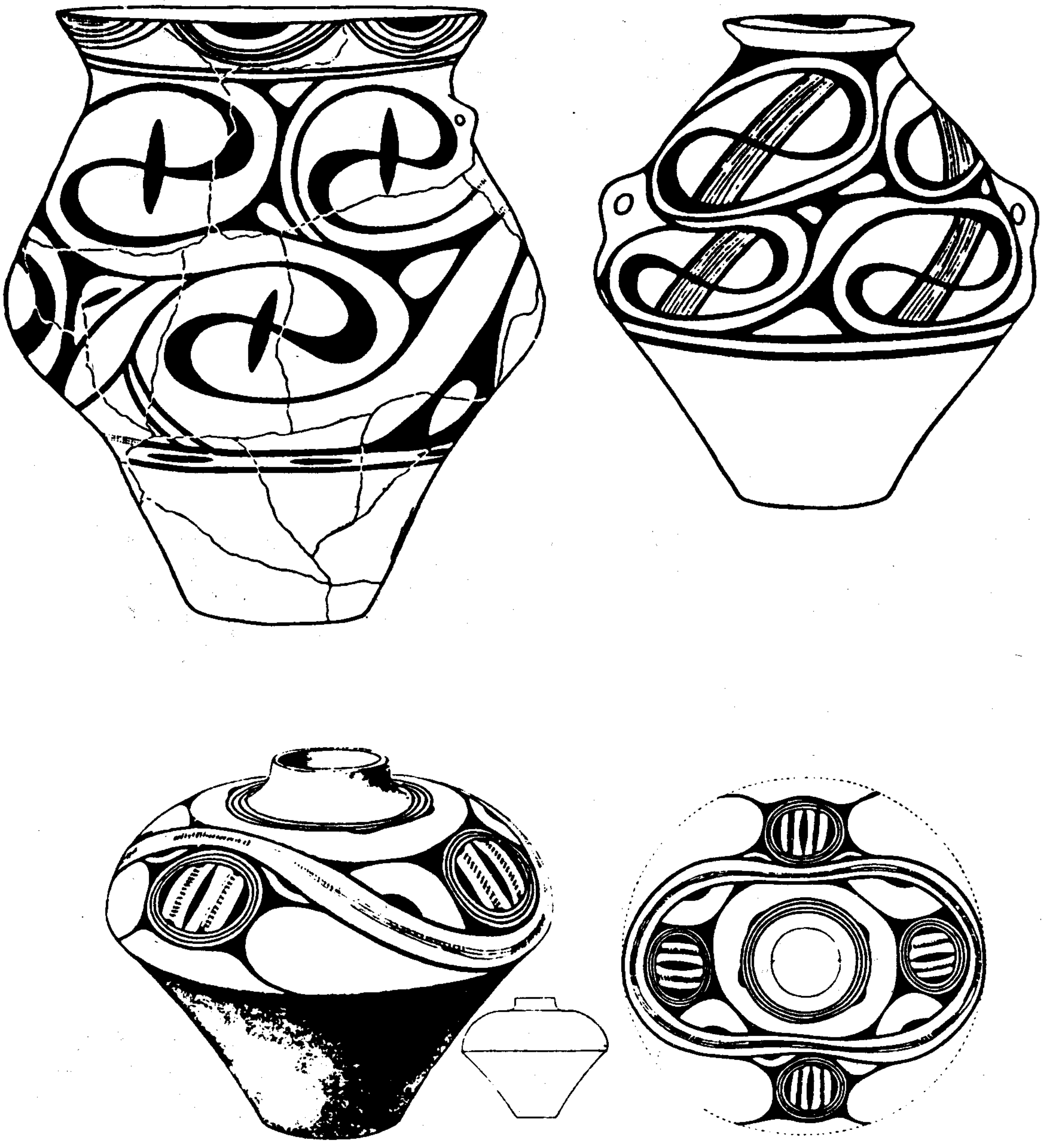


Fig. 76 Storage vessels from Vladimirovka (upper; 1/6 natural size) and Kriščatek (lower; 1/7 natural size).

lack of mobility of these vessels precluded their use for everyday food preparation.

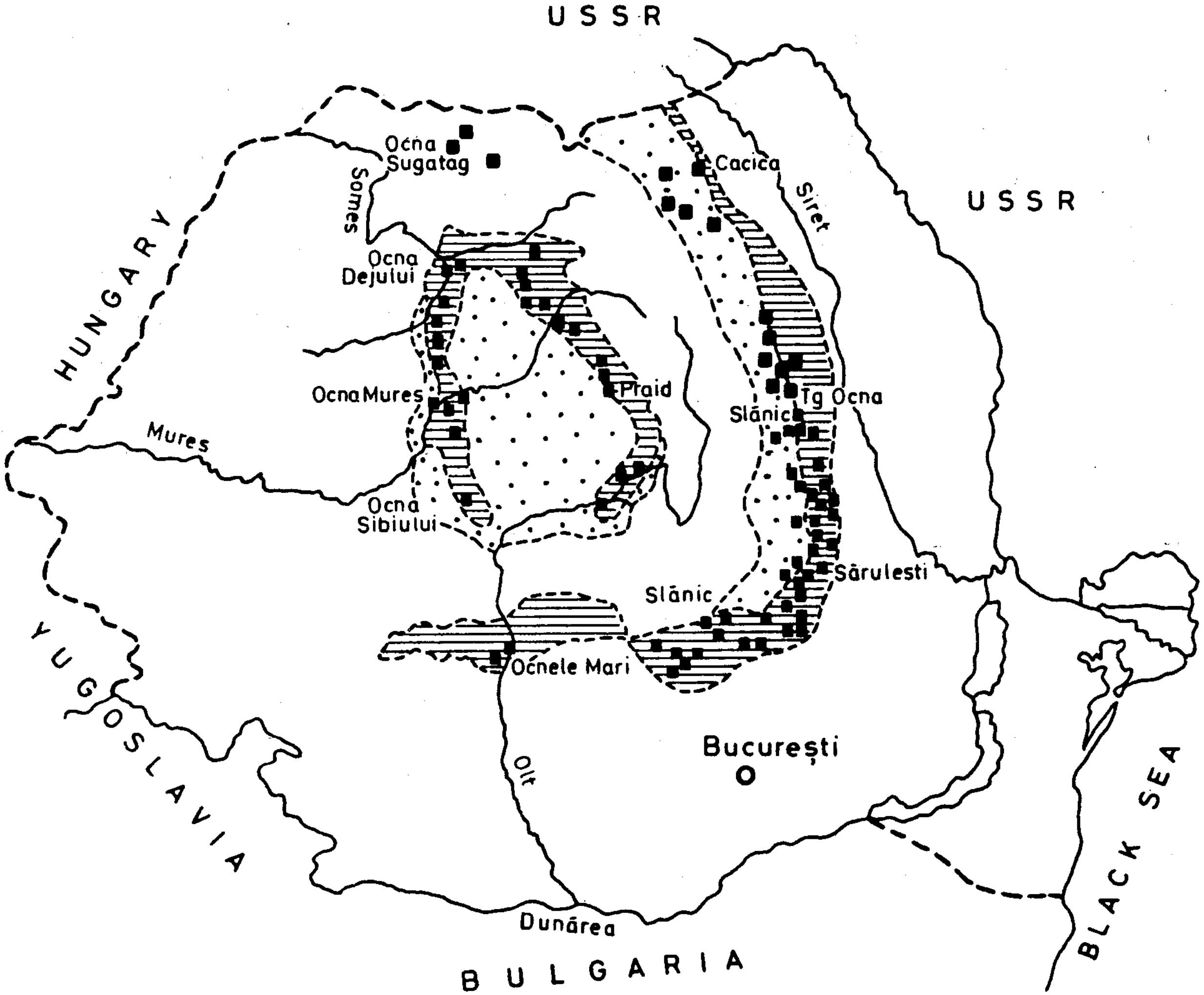
Besides their cumbersome physical characteristics, the archaeological context also offers some interesting details. Omnipresent in the reports of finds from Tripolye B II-C sites are the great quantities of vessels (as many as 50) that are found inside buildings (section IV.B.3). Many vessels have been found containing charred grain or animal bones, which has tempted some to regard this as "ritualistic" behaviour (section III.D). Also of note is the occurrence of very small buildings without hearths which were probably not dwellings, for instance buildings no. 7 at the Late Tripolye site of Kolomijščina I which measured 24 sq. m, contained more than 20 vessels, and was built quite close to a longhouse (no. 6) (Passek 1949:134). All of the foregoing suggest that the painted ware--especially the larger vessels--were being used predominantly for storage purposes. The voluminous shape, restricted orifices, well fired and dense walls, location, contents, and condition upon discovery all support their use as food storage containers.

The necessity for food storage becomes apparent when viewed in the context of a growing population, and this need becomes even more acute in relation to settlements which are unusually densely populated (cf. Halstead and O'Shea 1982). Although the black earth zone of the Ukraine is one of the most fertile regions in the world, this is no guarantee against the vagaries of weather--the health and longevity of prehistoric populations depends not only on agricultural productivity and the availability of game, but also on how well the winter and other poor seasons are survived. The superb technological capabilities, which were very early developed in the history of this culture, provided an excellent means for food storage against humidity and pests. This capability slowly but surely offered some additional assurance of food availability and larger numbers of people could be adequately supported. It is no accident that so many large and dense settlements have already been discovered and that they date to the latter phases of the culture. Population densification was a slow process but considering the number of large settlements so far known some guarantees of a stable food source had to have existed for a great length of time.

It is also no accident that the longest area of occupation for the Cucuteni-Tripolye culture (i.e. the Eastern Carpathians and sub-Carpathians) happens to be a region noted for one of the largest salt formations in Eastern Europe (map 27). Exploitation of, control over, and trading of this essential resource no doubt contributed to the stability of Cucuteni-Tripolye village life in the face of culture contact with eastern steppe pastoralists, as well as enhancing the quality of food storage, food consumption, and animal and human health.

### IV.C.2. From artistic endeavour to pragmatism: socio-economic needs and constraints on production

While technology enabled a growing population to achieve stability in food availability, the densification of the population at settlements as Petreny (Petreni) created enormous demands in terms of both culinary and food storage vessels and it is suggested here that more



Map 27 Salt formations in Romania.
(From: Ianovici and Borcoş 1982)

efficient means of production would have been a requirement at the behest of the socio-economic structure.

As has been stated in chapter III, once standards for paste preparation and firing technique had been established at the beginning of the painted ware sequence, the technological innovations to follow all related to the concept of mass production as a result of economic demands.

One of the practices to have been affected is the decorative technology. During the Cucuteni A (=Tripolye B I) period, almost every sort of ceramic object was painted: cups, jars, vessel supports, open bowls, dishes, figurines, and even ladels. Not only was the exterior surface completely covered in three colours, but, where feasible, the interior surface was also painted. This tradition continued into the Cucuteni AB period west of the Prut River. It appears that the ceramic medium became the object of an explosion in artistic and technological meticulousness beyond the bounds of practicality. The dramatic reduction in surface decoration which occurs during the Cucuteni B (=Tripolye C) period is part of the response of technology to economic demands.

The other part of the response involves the use of a simple wheel--direct evidence for which was found at Varvarovka VIII and Varvarovka XV and indirectly attested at Ghelăieşti, Văleni and Tîrgu Ocna-Podei--which could ensure a more uniform vessel and reduce production time (section III.B.2). Also in connection with rotary motion is the diminished variety in ceramic objects and the movement towards the standardisation of biconical vessels and open bowls.

The development of kilns began very early, as was noted for the site of Ariuşd in Transilvania. The development of the up-draught kiln followed very shortly east of the Carpathians. Since much time and energy were being invested in ceramic manufacturing, fire clouding, thermal shock and other firing accidents could be avoided, if not eliminated, within the kiln. Although firing time was probably longer than would have been in pit firings, the long, even firing produced a dense and sturdy vessel. And the very numbers of kilns found at later sites (e.g. seven at Žvanets, 18 at Koszyłowce-Oboz) attest to the demand for increased production (section III.C).

### IV.C.3. Energy and the organisation of labour in manufacturing

In the previous two sections, the interrelationships of technology and the socio-economic structure were explored solely in terms of the finished product. This analysis of output was discussed within the framework of an early advanced pyrotechnology with growing emphasis on mass production methods in order to serve the needs of settlement expansion and population agglomeration. However, this concluding section will delineate the technological and economic interrelationships from an energy, or input, point of view.

Concerning raw materials, tremendous amounts of clay, at a reasonable distance from the settlement or workshop, would have been necessary for both house construction and pottery manufacturing.

Likewise, the construction of kilns required the use of clay as well as sand and straw. In fact, it is difficult to visualise the procurement of the necessary quantities of this raw material, especially at the densely settled sites and settlements where many kilns were found, without the assistance of several full-time male workers, even if needed only seasonally. There is an indication that the kilns may have been built right at the clay source; however, only data from one site, Drăguşeni, confirms this observation (section III.C.1). The procurement of wood for fuel consumption, as well as the use of wood in general, must have also required considerable manpower. Wood was used not only for firing ceramics but also for building construction.

In terms of human energy, labour had to have been diversified in three areas: procurement of clay and other raw materials (e.g. minerals for pigments, water, sand, straw), fuel/wood procurement, and in pottery production itself. Although no quantitative data can be offered here, the above-described requirements for fuel and raw materials together with the manufacturing process itself removed adult human labour from agricultural and other food-getting activities. This is no more apparent than in the high artistic and technological quality of the finished products, uniform production methods, the quantity and detailed construction of kilns, and the use of buildings solely for manufacturing activities, all of which indicate a substantial investment in time and human energy--an investment and a detailed empirical knowledge of technology that preclude any idea of casual pottery-making. On the contrary, not only is the presence of several labourers for the procurement of fuel and raw materials indicated, but also the presence of several types of craft specialists who were knowledgeable in clay refinement, rotary motion and vessel formation, decorative technology, and/or kiln construction and firing techniques. Von Stern's excavations at Petreny may have revealed an entire craft district or manufacturing centre at the boundaries of the settlement where activities could be co-ordinated and organised into efficient ceramic production (section III.D). The removal of human energy from agricultural duties again underlines the necessity for excess food production, food storage, and the socio-political structure with the power to direct communal endeavours and redistribute foodstuffs to those involved with ceramic manufacturing.

## IV.D. Conclusion

Over the course of discussions, we have seen several trends in pyrotechnology and the socio-economic reaction to those developments. During the Pre-Cucuteni (=Tripolye A) period, pottery-making continued on the level of a household industry which served the needs of the individual family or village. However, with innovations in decorative and firing technology of the Cucuteni A (=Tripolye B I) period, ceramic production is consolidated and made into a more efficient operation as can be seen by the appearance of sites with large numbers of kilns--a trend which continues throughout the sequence and culminates with the occurrence of ceramic workshops and possibly also craft districts at the outskirts of very large settlements.

An early mastery over ceramic manufacturing--in terms of the refinement and manipulation of clays and control over firing temperature and atmosphere--ensured a high quality product. Other trends in the manufacturing of ceramics--i.e. increased quantities of large, rotund vessels with restricted orifices--as well as the circumstances of discovery--i.e. accumulations of whole vessels in dwellings and/or storage buildings with no evidence of cooking use--all indicate an intense preoccupation with food storage capability on the part of Cucuteni-Tripolye populations. This feature comes as no surprise when one considers the growing population densification during the last period of the Cucuteni-Tripolye culture.

But, while advancements in pyrotechnology allowed a more stable food supply and therefore assisted the maintenance of higher populations, one of the more intriguing phenomena is the role of socio-economic needs in the selection of certain technological innovations. As opposed to the earlier incised/excised wares, the later painted wares are noticeably more uniform in terms of the fabrication of a fine-grained, dense paste fired to a high temperature in a well oxidised atmosphere. Physical, as well as technological, characteristics of ceramics became more uniform in terms of vessel size, shape and decoration. All of the foregoing indicate a concerted effort to set minimum high standards of ceramic manufacturing; and in achieving those standards in the face of great economic demand, mass production methods--such as the use of rotary motion, reduced surface embellishment, and the use of up-draught kilns to reduce wastage--were employed to ensure the availability of ceramic products.

The very beginning of ranked society is a stage in the spectrum of human social evolution that is still poorly understood and documented. The Cucuteni-Tripolye culture was offered here merely as an example of a society undergoing technological and social evolution during the Neolithic to Bronze Age transition period in European prehistory. This particular data base is by no means representative of cultures of other eras nor of other regions whose unique circumstances mold their individual destinies; rather this study was presented to show one instance of the role technological development can have in the transformation of socio-economic relationships and vice versa, over a period of about 1000 years, from small, settled farming villages to the embryonic development of a ranked society.

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Abbreviations:

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|---|---|
| CA | Cercetǎri Arheologice |
| MCA | Materiale şi Cercetǎri Arheologice |
| MIA | Materialy i Issledovanija po Arkheologii SSSR |
| SCIV | Studii şi Cercetǎri de Istorie Veche |
| SCIVA | Studii şi Cercetǎri de Istorie Veche şi Arheologie |

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